THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1910

National District Heating Association

Second Annual Convention, Toledo, O., June 1—3, 1910

Central station heating engineers to the number of nearly 100 met in Toledo, June 1-3, on the occasion of the second annual convention of the National District Heating Association.

The vigor shown by this association in the splendid attendance was responded to in a handsome manner by manufacturers of central heating supplies, their exhibits being of an unusually elaborate nature and fairly crowding the lobby of the Boody House, where the convention was held.

A damper was cast over the first day's proceedings by the receipt of a telegram announcing the critical illness of the father of Secretary Gaskill. Mr. Gaskill left immediately for his home in Greenville, where he arrived shortly before his father died. In his absence John Whitely was appointed secretary pro tem.

GEORGE W. WRIGHT, BALTIMORE, MD., NEWLY ELECTED PRESIDENT, NATIONAL DISTRICT HEATING ASSOCIATION

The arriving delegates found, however, that admirable arrangements had been made for their entertainment and comfort. Ribbon badges containing the printed names of the members were provided and a special headquarters room near the lobby of the hotel was supplied with convention matter and was at the convenience of the members.

The first session was called to order by President A. C. Rogers, of the Toledo Railways and Light Co., Wednesday, June 1, at 10 a. m. The following were present at this or the subsequent sessions:

THOSE PRESENT

A. C. Rogers, Toledo Railways & Light Co., Toledo.

D. L. Gaskill, Greenville, O.

J. F. Billmyre, New York.

E. B. Tyler, Pittsburg, Pa.

Collingham W. Franklin, Heat, Light & Power Co., Leipsic, O.

Grant Miller, Citizens' Lighting & Heating Co., Toledo, O.

W. E. Rich-

ards, Toledo Railways & Light Co., Toledo, O.

Robert Ilett, Valentine Heating Co., Toledo, O.

William Long, Toledo Railways & Light Co., Toledo, O.

Oscar F. Rabbe, Toledo, O.

Geo. W. Wright, Baltimore Refrigerating & Heating Co., Baltimore, Md.

Byron T. Gifford, Central Station Engineering Co., Chicago.

Charles R. Bishop, American District Steam Co., Lockport, N. Y.

W. W. Macon, New York.

Mrs. W. B. Hall, Toledo.

W. H. Schott, Chicago.

Albert Sandt, Clinton Gas & Electric Co., Clinton, Ill.

Frank C. Reeder, Knoxville, Tenn.

W. A. Wolls, Columbus Railway & Light Co., Columbus, O.

H. W. Booth, United States Heater Co., Detroit, Mich.

Emmons Collins, Cleveland, O.

W. K. Martin, Crawfordsville Heating Co., Crawfordsville, Ind.

D. D. Raymond, Economy Street Heating & Electric Co., Sedalia, Mo.

D. K. Dean, New York.

E. A. Calvert, Quincy Gas, Electric & Heating Co., Quincy, Ill.

R. D. De Wolf, Rochester Railway & Light Co., Rochester, N. Y.

Harry de Joannis, Chicago.

H. G. Powell, Springfield Light, Heat & Power Co., Springfield, O.

E. J. Kiefer, People's Consolidated Gas Companies, Easton, Pa.

G. H. Jungk, Fremont Yaryan Co., Fremont, O.

H. R. Witherell, Peoria Gas & Electric Co., Peoria, Ill.

Oliver J. Haller, Pittsburg, Pa.

William Pooley, Toledo Railways & Light Co., Toledo, O.

F. V. Clark, New York.

D. J. Hard, Cleveland Light & Power Co., Cleveland, O.

C. H. Staten, Cleveland, O.

J. F. Bordley, Central Station Steam Co., Detroit, Mich.

Henry Laidlaw, Detroit, Mich.

W. J. Crambs, Seattle Electric Co., Seattle, Wash.

T. D. Buckwell, Toledo Railways & Light Co., Toledo, O.

R. H. Fernald, U. S. Geological Survey, Cleveland, O.

E. W. Osborn, Rockford Electric Co., Rockford, Ill.

R. D. Spencer, Central Heating Co., Detroit, Mich.

H. T. Nye, Toledo.

P. T. Morrissey, Central Heating Co., Detroit, Mich.

Geo. D. Higgins, Murphy Heating Co., Detroit, Mich.

Jos. H. Meyer, Detroit, Mich.

R. E. Woolley, Schenectady, N. Y.

E. C. Johnston, Columbus, O.

Jos. L. Sheldon, Toledo.

Arthur Taylor, Toledo.

Edward R. Kirby, Cleveland, O.

Geo. D. Cole, Toledo Railways & Light Co., Toledo, O.

G. D. Bly, Monarch Supply Co., Toronto, Can.

C. C. Custer, Miami Light, Heat & Power Co., Piqua, O.

W. L. Klingelhofer, Pittsburg, Pa.

John Gilmartin, Toledo Railways & Light Co., Toledo, O.

W. L. Brown, Toledo.

F. H. Stevens, Chicago.

William J. Reilly, Cleveland.

E. J. Weholy, Toledo, O.

D. D. Flanner, Toledo, O.

Jos. F. Grosswiller, Toledo.

D. E. Badger, Cambridge, Mass.

H. A. Fen, Citizens' Light & Power Co., Adrian, Mich.

E. A. Lucky, Central Heating Co., Detroit, Mich.

J. T. Trombley, Central Heating Co., Detroit, Mich.

A. S. Armagnac, New York.

L. L. Barnes, Chicago.

Hal C. Kimbraugh, Chicago.

Joseph B. Smith, Jr., Bay City, Mich.

James A. Donnelly, New York.

John D. Walsh, Lockport, N. Y.

A. B. Marshall, New York.

A. P. Seltzer, Cleveland, O.

C. T. Chapman, Toledo & Western R. R., Toledo, O.

L. D. West, Cuyahoga Light Co., Cleveland, O.

Frank Espy, Tiffin Electric Co., Tiffin, O.

James Baxter, Tiffin, O.

J. F. Lewis, Murphy Heating Co., Detroit, Mich.

CONVENTION PHOTOGRAPH, NATIONAL DISTRICT HEATING ASSOCIATION, TOLEDO, O., JUNE 1-3, 1910

J. O. Klingelhofer, Pittsburg, Pa.

President Rogers then read his address:

President's Address

Friends—Fellow Engineers:

This is to me a happy moment. We are assembled again in this, our second annual convention, with every indication that the reasons for this association have been well taken.

The engineer to-day occupies a high place, and by virtue of his training his judgment is taken and thousands of dollars are invested upon his word and under his supervision. The engineering profession has been divided, and rightly too, into various branches, so that adaptation to the various lines might be emphasized.

In remote times we read of the alchemists, who were undoubtedly the chemical engineers, dividing Mother Earth into her component parts, and yet we pause at this statement upon contemplating some of the ancient works, for there were undoubtedly hydraulic engineers in fact, if not in name; and similarly bridge engineers, too; and, coming down to the present day, we have our architectural, mechanical, electrical, civil, hydraulic, mining, chemical, bridge, gas, agricultural, naval, heating and ventilating engineers.

Civilization has brought its new and added needs and specification has been the inevitable result of the progressiveness of the age and the demands of society. This American continent on which we live and work has a definite history of practically four centuries; and from a commercial view of about one century, and yet in that time population and with it business activity has increased, so that the engineer has been brought more prominently to the foreground.

Our natural resources have been so abundant that we have been drawing on them without thought of results or consequences. It is at the present time that we are beginning to talk conservation, and while the engineer has always worked with a knowledge of economy, yet to-day we realize that an absolute necessity exists to put in operation all that the name implies.

It is for the future, the retrenchment of our waste, the conservation of all our natural wealth, that the world looks to the engineer. The mines need their resources to be prolonged, so that future generations may enjoy some of the good of them; we can say the same of almost all our avocations.

ISOLATED POWER HOUSE TO BE ELIMINATED

In the problems which this association is most particularly interested, we must join hands with the mechanical and electrical fraternity. Conservation is the keynote, and the ultimate results of that will be the elimination of the isolated power house, the concentration of all generating resources, to the end that large units with all the economical apparatus and surroundings, of location, buildings, equipment and men will give us the most for the least, the last reduction in productive costs, the largest output for the same. And with that will come the district heating system, its enlargement and growth.

The important events in society, business, science are mainly in the Temperate Zone. Man has made his greatest strides and written more and larger in this world's history in the temperate belt than in all other localities; yet one of his needs due to climatic conditions is warmth. This must be augmented in most of the temperate belts by artificial means. All his exertions are fully realized and unhampered when in an environment of proper warmth. Life in its fullest is developed when this want is supplied.

As your president, may I ask as a prophecy, a prediction, and also a wish that this society may prosper, that its membership may be augmented until its rolls carry all who may be helpful to it, and whom it may help, and that its members as individuals may fit themselves so that we may as a society be able, at least, to meet the demands for district heating, and in a fully prepared and completely competent manner.

Mayor Brand Whitlock, of Toledo, then welcomed the association to Toledo, his words of welcome being responded to by Mr. D. J. Hard, of the Cleveland (O.) Light & Power Co.

In the absence of Mr. Gaskill, the secretary's report was read by Mr. W. A. Wolls. The report showed a growth of 26 members during the year; the present number being 59 active members, representing 23 States.

SECOND SESSION, JUNE 1, 2 P. M.

At the second session two papers were read, one by W. A. Wolls, of the Columbus Railway & Light Co., Columbus, O., on a "Description of a Modern Central Hot Water Heating Station," and one by A. D. Spencer, superintendent of the meter department, Central Heating Co., Detroit, Mich., on "Central Station Heating in Detroit." Both of these papers will be published, with the discussion,

in THE HEATING AND VENTILATING MAGAZINE.

MORNING SESSION, JUNE 2

Immediately upon convening, the association was treated to a most interesting lecture on "Humidity, Its Necessity and Benefits," by W. W. Brandt, M.D., Health Officer of Toledo. Dr. Brandt showed himself to be thoroughly familiar with the scientific aspects of his subject and his address was warmly received.

The next paper was entitled "Central Station Heating," by F. H. Stevens, of Chicago. This paper is presented, in substance, herewith:

*Central Station Heating**

BY F. H. STEVENS, CHICAGO, ILL.

It is not true that a district heating system would be a dividend producer everywhere, but each locality has its particular conditions governing the success of the business, and there is no rule or set of rules that govern this condition of success.

Almost from the first the advocates of central station heating have had the opposition of the consulting engineer and the engine manufacturers, and it is only very recently that they have accepted the statements of results obtained from district heating as a matter of fact, and in some cases they have been forced by their clients to recognize the heating system as an important revenue producer.

In the case of the engine manufacturers it is readily seen why they did not want a heating system installed to operate in connection with their engines, utilizing the exhaust from said engine to supply the heating system, as it would not allow the engine to operate at a high efficiency; in other words, instead of producing a K. W. hour at full load, with from 18 to 20 lbs. of steam, the consumption in extreme cold weather would be from 40 to 50 lbs. of steam per K. W. hour.

From the first impression of the above figures it would seem that the consulting engineer and engine manufacturer were justified in their opposition to a heating system being attached to the engine. Let us carry this investigation a little farther, and assume for the sake of comparison that the electric load is 5,000 K. W. hours; that the prime movers are of compound Corliss type to be operated condensing under a 26 in. vacuum, and the manufacturer's guarantee is 20 lbs. per K. W. hour or a total of 100,000 lbs. of steam per hour required.

Now let us assume that the engines are to be operated non-condensing and exhaust to a heating system, resulting in a maximum back pressure of 5 lbs. and that the consumption of steam by the engine will be 45 lbs. per K. W. hour, or a total of 225,000 lbs. of steam required.

In either case we have 5,000 K. W. hours of electric current for sale, the revenue from which will be the same; this we will assume is 5c. per K. W. hour or $250.00 total revenue.

In the case of the plant operating with a heating system we have in addition to the $250.00 revenue from the sale of electric current, 225,000 lbs. of steam for heating, from the sale of which at a rate of 60c. per 1,000 lbs. would produce $135.00 or a total revenue of $385.00.

It will be seen that in the case of the heating system it required 125,000 lbs. more steam to produce 5,000 K. W. hours of current. Assuming that the coal cost $2.50 per ton, water 5c. per thousand gallons, and firing 30c. per ton, with an evaporative efficiency of 7 lbs. of water per pound of coal burned, the manufacturing cost of steam would be 21c. per 1,000 lbs., or a total extra cost of $26.25 to generate 5,000 K. W. hours of electric current, or a net gain of $108.75 in favor of the heating system.

The above is also true of plants of

*Read before the National District Heating Association, Toledo, O., June 1—3, 1910.

smaller size and the ratio of increase in revenue is approximately the same. The best results are obtained where due consideration is given the heating system when selecting the prime mover to be installed.

In conclusion let me impress firmly upon your minds that in considering the district heating business it should be assumed that you are to manufacture steam for no other purpose than heating, not considering the exhaust steam a by-product, but let the profit increase in nearly the same ratio that exhaust is used instead of live steam, or consider the electric output the by-product.

COMMITTEE ON REVISION OF CONSTITUTION

At the close of this session a resolution, proposed by Mr. Geo. W. Wright, was adopted directing the appointment of a committee of three to revise the association's constitution. President Rogers appointed as this committee: D. L. Gaskill, Greenville, O.; Geo. W. Wright, Baltimore, Md.; and Grant Miller, Toledo. This committee will report to the executive committee by April 1, 1911.

Another resolution was offered by Mr. F. V. Clark, of New York, and adopted, expressing the sympathy of the association with Secretary W. L. Gaskill in the death of his father.

AFTERNOON SESSION, JUNE 2

The afternoon session was opened with a symposium on "A Study on Insulation," papers on this subject being read by W. E. Richards, of the Toledo (O.) Railways and Light Co., and by C. H. Staten, of Cleveland, O.

The next paper was on "A Study in Centralizing the Heat Supply," by Prof. J. D. Hoffman, of Purdue University, Lafayette, Ind. The paper of Prof. Hoffman, who is president of The American Society of Heating and Ventilating Engineers, is presented herewith:

The Comparative Economy of Central and Private Heating Plants

The Superiority of Exhaust Steam Over Live Steam for Heating

By Prof. J. D. Hoffman

A valuable contribution to the discussion of the superiority of exhaust over live steam for heating purposes is contained in a paper on "A Study in Centralizing the Heat Supply," by Prof. J. D. Hoffman, read at the second annual convention of the National District Heating Association, at Toledo, June 1-3. The substance of Prof. Hoffman's paper is given herewith:

THE FACTOR OF ECONOMY

The centralization of the heat supply for any district has an advantage over a number of smaller units in being able to burn the fuel more economically as well as being able to reduce labor costs. It has also the advantage, when in connection with any power plant, of saving a large amount of the heat that would otherwise go to waste in the exhaust steam and the stack gases and turning it into the heating system. If it becomes merely a question of burning the coal in the boiler and turning this heat at once into the heating system, there would not be so much advantage in centralization, because the loss in the conduit would probably counteract other small advantages gained in the plant.

The price of the coal would in such cases be the controlling factor, because a much cheaper grade of coal may be used in the large plant than in the smaller ones. The chief advantage in centralization at this time, however, is in the economy of the exhaust steam and the stack gases. In this connection the many electric lighting and pumping stations about the country give large

opportunities for heating engineers to study the economics of heating. Since the average steam power plant is very wasteful in these two particulars, any saving that could be brought about should certainly be sought for.

CONDUIT LOSSES

The one principal objection that is being urged against centralization is that it necessitates transmitting the heating medium through a system of conduits, which in many cases is a wasteful process. Improvements are continually going on to perfect the conduit work and to protect from large heat losses, but as yet we have a large field for improvement before us. Concerning the losses from conduits no very satisfactory values may be given. Everything depends upon the quality of the materials and the workmanship in the installation. The materials used in the walls are wood, tile, brick and concrete; and all sorts of conditions may be found between the pipe and the conduit wall.

In some cases there are no insulating materials whatever between the bare pipe and the wall; in others, wood chips, hair felt, mineral wool, etc., are packed in loosely around the pipes, while in others fibrous sectional coverings are applied to the pipes either in connection with or without the chips, felt and wool. Because of the wide variety of practice, it would not be worth the time spent to attempt to estimate heat losses upon a theoretical basis.

The writer believes that the best grade of conduit and installation will be able to keep the radiation losses below 10%, but that many installations will lose from 20% to 30% of all the heat sent out from power plant.

AMOUNT OF HEAT IN EXHAUST STEAM COMPARED WITH THE AMOUNT IN SATURATED STEAM AT THE PRESSURE OF THE EXHAUST

To study the effect of exhaust steam upon heating problems and to determine, if possible, the theoretical amount of heat given off with the exhaust steam under various conditions of use, let us make several applications: first, to a simple high speed non-condensing engine using saturated steam; second, to a compound Corliss non-condensing engine using saturated steam; third, to first application when superheated steam is used instead of saturated steam; and fourth, to a horizontal reciprocating steam pump.

Assume the following safe conditions: Case 1—boiler pressure 100 lbs. gage; pressure at cylinder 97 lbs. gage; quality of steam at cylinder 98%; steam consumption 34 lbs. per indicated horse power hour, 1% loss in radiation from cylinders; and exhaust pressure 2 lbs. gage.

Case 2—boiler pressure 125 lbs. gage, pressure at cylinder 122 lbs. gage; quality of steam at cylinder 98%; steam consumption 22 lbs. per indicated horse power hour; 2% loss in radiation from cylinders and receiver pipe; and exhaust pressure 2 lbs. gage.

Case 3—same as Case 1 with superheated steam at 150° of superheat.

Case 4—as stated later.

The number of B. T. U. exhausted with the steam in any case is, total heat in the steam at admission, minus the heat radiated from the cylinder, minus the heat absorbed in actual work in the cylinder.

HIGH SPEED ENGINE

Case I (Application). Let r = heat of the vaporization per pound of steam at the stated pressure, X = quality of the steam at cut off, q' = heat of the liquid in the steam per pound of steam, and W = pounds of steam per indicated horse power hour. From this the total number of B. T. U. entering the cylinder per horse power hour is

Initial B. T. U. $= W (xr + q')$

From Peabody's steam tables r

= 881, X = 0.98 and q′ = 307; then if W = 34, initial B. T. U. = 34 (0.98 × 881 + 307) = 39,792.92 Deducting the heat radiated from the cylinder we have 39,792.92 × 0.99 = 39,395 B. T. U. per horse power left to do work. The B. T. U. absorbed in mechanical work (useful work + friction) in the cylinder per horse power hour is, (33,000 × 60) ÷ 778 = 2,545 B. T. U. Subtracting this work loss we have 39,395—2,545 =36,850 B. T. U. given up to the exhaust per horse hour.

Comparing this value with the total heat in the same weight of saturated steam at 2 lbs. gage we have 100 × 36,850 ÷ (34 × 1,152) = 94%.

COMPOUND CORLISS ENGINE

Case 2 (Application). With the same terms as above let r = 867.4, X = 0.98 q′ = 324.4, and W = 22, then the initial B. T. U. = 22 (0.98 × 867.4 + 324.4) = 25,837.9. Less 2% radiation losses = 25,837.9 × 0.98 = 25,321.14 B. T. U. The loss absorbed in doing mechanical work in the cylinder per horse power is, as before, 2,545 B. T. U. Subtracting this we have 25,321.14 — 2,545 = 22,776.14 B. T. U., given up to the exhaust per H. P. hour. Comparing as before with saturated steam at 2 lbs. gage, we have 100 × 22,776.14 ÷ (22 × 1,152.8) = 90%.

Case 3 (Application). Now suppose superheated steam be used in the first application, all other conditions being the same, the steam having 150° of superheat, what difference will this make in the result? The total heat entering the cylinder now is the total heat of the saturated steam at the initial pressure plus the heat given to it in the superheater. This for 1 H. P. of steam (34 pounds), if the specific heat of steam is 0.48, would be 34 × 0.99 × (1,188 + 0.48 × 150) = 42,411.6 B. T. U. and the heat turned into the exhaust will be 42,411.6 — 2,545 = 39,866.6 B. T. U. Comparing this with the heat in saturated steam at 2 lbs. gage = 100 × 39,866.6 ÷ (34 × 1,152.8) = 102%.

Case 4 (Application). Pump exhausts are sometimes led into the main and used for heating purposes along with the exhaust steam from the engines. If such condition be found, what is the heating value of such steam? Assume the steam to enter the steam cylinder of the pump under the same pressure and quality as recorded for the high speed engine. The steam is cut off at about ⅞ of the stroke and expands to the end of the stroke. With this small expansion the absolute pressure at the end of the stroke would be approximately ⅞ × 112 = 98 lbs., and if enough heat is absorbed from the cylinder wall to bring the steam up to saturation at the release pressure, we will have a total heat above 32° in the exhaust steam per pound of steam at 98 lbs. absolute of 1,185.6 B. T. U. Comparing this with a pound of steam at 2 lbs. gage we have 100 × 1,185.6 ÷ 1,152.8 = 103%. Under the conditions such as here stated with a high release pressure, a small expansion of steam in the cylinder and dry steam at the end of the stroke, it is possible to suddenly drop the pressure from pump release to a low pressure, say 2 lbs. gage, and have all the steam brought to a state approaching superheat. It is not likely, however, that the steam is dry at the end of the stroke in any pump exhaust. The heat absorbed in radiation and in doing work in the slow moving pump would be such as to have a considerable amount of entrained water with the steam, thus lowering the quality of the steam. These above conditions are extreme and are not obtained in practice.

From Cases 1 and 2 it would appear that the greatest amount of heat that can be expected from engine exhausts, for use in heating systems, at or near the pressure of the atmosphere, is 90% to 94% of that of saturated steam at the same pressure. The percentage will, in most cases, drop much below this value. All things considered, exhaust steam having 80% of the

value of saturated steam at the same pressure is probably the safest rating when calculating the amount of radiation to be supplied by the engines. In many cases no doubt this could be exceeded, but it is always best to take a safe value. On the other hand, when figuring the amount of condenser, tube surface or reheater tube surface, to condense the steam, it would be best to take exhaust steam at 100% quality since this would be working toward the side of safety.

CAUSE OF SUPERIORITY OF EXHAUST STEAM FOR HEATING

In plants where the exhaust steam is used for heating purposes and where the amount supplied by direct acting steam pumps is large compared with that supplied by the power units, it is possible to have the quality of the exhaust steam fairly high. This condition is sometimes met with in practice, and may be the explanation of the statement sometimes heard, that exhaust steam gives better service for heating purposes than saturated steam at the same pressure. It should be understood that saturated steam at any stated pressure always has the same number of B. T. U. in it, no matter whether it is taken directly from the boiler, or from the engine exhaust. A pound of the mixture of steam and entrained water, taken from engine exhausts, should not be considered as a pound of steam. If we are speaking of a pound of exhaust steam without the entrained water as compared with a pound of saturated steam at the same pressure, they are the same, but a pound of engine exhaust or mixture is a different thing. In cases where engine and pump exhausts are mixed, the available heat per pound of steam will be somewhere between 800 and 1000 B. T. U. As suggested above, however, a safe value for general work is the lower figure.

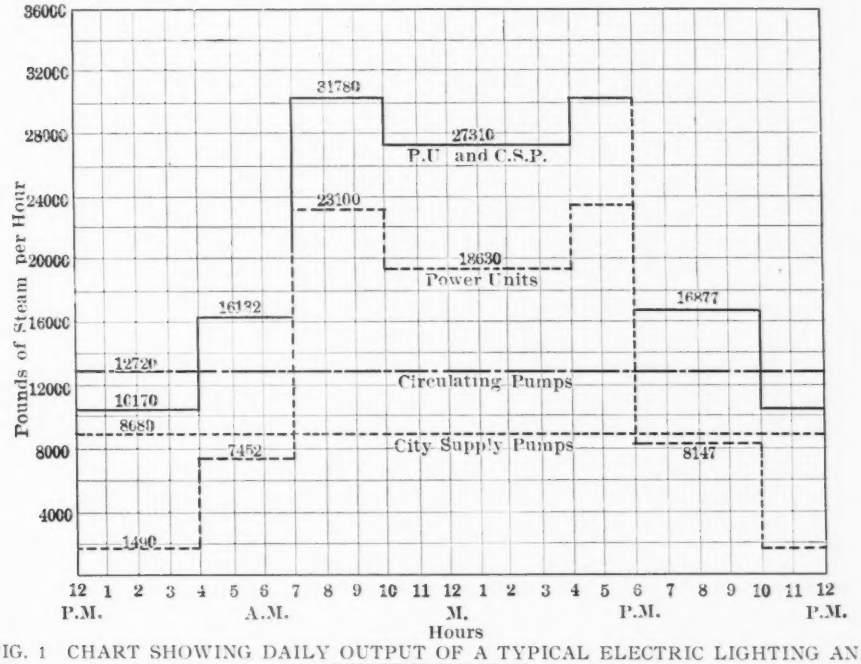


FIG. 1 CHART SHOWING DAILY OUTPUT OF A TYPICAL ELECTRIC LIGHTING AND PUMPING STATION

CAPACITY OF THE TYPICAL PLANT AND THE AMOUNT OF RADIATION SUPPLIED BY THE EXHAUST STEAM

Following the general discussion of the value of exhaust steam in heating systems. It would be well to assume a specific case for the sake of argument.

The first thing to be determined is the capacity of the heating plant,

which is to form the basis of the discussion. Suppose, for example, that there is an electric lighting and pumping station in the district, having 23,100 lbs. of exhaust steam per hour (maximum) from the lighting and power units and a constant supply of 8680 lbs. of exhaust steam from the city water supply pumps (Fig. 1., taken from the daily plant output). Suppose also that this amount be considered sufficient to justify a design of 184,500 sq. ft. of hot water radiation (123,000 sq. ft. of steam) in the district. This amount of radiation should have about 184,500 gals. of water allowed per hour to supply it and it would in all probability call for a 12-in. pipe. With a pressure of 65 lbs. per square inch on the outgoing line and 20 lbs. per square inch on the return line, the direct acting steam pumps will consume about 127.2 H. P. which at 100 lbs. of steam per horse power hour will give off 12,720 lbs. of exhaust steam per hour. This, when added to the exhaust steam from the engines and the city supply pumps, gives a maximum of 44,500 lbs. of steam per hour to be used for heating the circulating water in the heating systems.

Now, since a pound of exhaust steam may be safely counted on to give up 800 B. T. U., as previously stated, and since each pound of water going through the plant, is heated through a rise of about 30°, thus giving it 30 B. T. U., 1 lb. of exhaust steam will heat 800 ÷ (30 × 8.33) = 3.2 gals. of water. Stated in other words, 1 lb. of exhaust steam will supply 3.2 sq. ft. of radiation in the district for one hour on a zero day, and the 44,500 lbs. of steam would supply 142,400 sq. ft.

AMOUNT OF RADIATION IN THE DISTRICT THAT CAN BE SUPPLIED WITH HEAT BY AN ECONOMIZER IN THE STACK GASES LOCATED BETWEEN THE BOILERS AND THE CHIMNEY

In order to make this estimate it is necessary, first, to know the horse power of the boilers, the amount of coal burned per hour, the pounds of gases passing through the furnaces per hour, and the heat given off from this gas to the circulating water through the tubes. From a previous statement, 44,500 lbs. of steam per hour is generated in the steam boiler plant at a pressure of 125 lbs. gage. To find the boiler horse power, let the total heat of the steam at 125 lbs. gage be 1191.8 B. T. U. and the temperature of the incoming feed water to the boilers be 60°. (In most cases the feed water will be at a higher temperature, but since it may occasionally be as low as 60°, this value should be taken.)

The heat put into a pound of steam is, therefore, 1,191.8 — 60 + 32 = 1163.8 B. T. U., and in 44,500 lbs. it will be 51,789,100 B. T. U. Since 1 H. P. of boiler service is equivalent to 34.5 × 969.7 = 33,455 B. T. U., we will have 51,789,100 ÷ 33,455 = 1,548 boiler horse power. This horse power will take care of all the engines and pumps in the plant. If the coal used contains 13,000 B. T. U. per pound and the boilers have 60% efficiency, then 13,000 × 0.60 = 7,800 B. T. U., given to the water per pound of fuel burned.

The pounds of coal burned per hour will be 51,789,100 ÷ 7,800 = 6,640 total. This means 6,640 ÷ 1,548 = 4.3 lbs. of fuel per boiler horse power hour. It also means 6.7 lbs. of water evaporated per pound of fuel. If the flue gases have 12% CO_2 then there is being used about 21 lbs. of air or 22 lbs. of the gases of combustion per pounds of fuel burned. This is equivalent to 6,640 × 22 = 146,080 lbs. of flue gases total. Suppose now that these gases leave the furnace for the chimney at a temperature at 550° F., that the economizer drops the temperature of the gases down to 350° (a condition which is very reasonable) and that the specific heat of the gases is about 0.22, we have 146,080 × 0.22 × (550 —

350) = 6,427,520 B. T. U., given off from the gases in passing through the economizer. This heat is taken up by the circulating water in passing through the economizer toward the outgoing main.

Now, if the water, as it returns, from the circulating system, enters the economizer at 150° and leaves at 180°, we will have 6,427,520 ÷ (180 — 150) = 214,251 lbs. of water heated per hour. This is equivalent to supplying 214,251 ÷ 8.33 = 25,720 sq. ft. of radiation per hour when the plant is running at its peak load. Taking the "pounds of steam per hour," in the above as the only variable quantity we are fairly safe in saying that the heat in the chimney gases from 1 H. P. of steaming boiler service will supply, through an economizer, 16.5 sq. ft. of radiation in the district.

BOILER HORSE POWER NECESSARY TO HEAT THE RADIATION NOT SUPPLIED BY THE EXHAUST STEAM AND THE ECONOMIZER

Since the economizer surface from 1 boiler horse power will supply 16.5 sq. ft. of radiation in the district on a zero day, that from 1,548 boiler horse power will supply 25,720 sq. ft. of radiation; also, since 44,500 lbs. of exhaust steam will supply 142,400 sq. ft. of radiation on a zero day, we have a total of 168,120 sq. feet. suplied by both methods.

It is evident then that 16,380 sq. ft. must be heated by some other method. It is probably not safe to estimate too closely on the amount of exhaust steam given to the heating system. The maximum amount of 44,500 lbs. is obtained, in part, by pumping 1 gal. of water per hour for each square foot of radiation, and, in part, by pumping city water.

In the first case, less water than this may be pumped, even on the coldest day. This is possible, first, because water may be carried at a higher temperature than that stated, and second, because there may be less loss of heat in the conduit, thus giving more heat per gallon of water to the radiation.

In the second case the demands upon the city water supply are not very constant and are difficult to estimate. All things considered, probably it would be better to take a much lower value, say 35,000 lbs. of exhaust steam per hour and 112,000 sq. ft. of radiation supplied. If this viewpoint be taken, then the exhaust steam and the stack gases together will heat 137,720 sq. ft. and there will be left 46,780 sq. ft. to be heated by other means.

Suppose it be the desire to install steaming boilers and to use these boilers as heaters for the remaining radiation.

One boiler horse power is equivalent to 33,455 B. T. U., per hour, and will supply 33,455 ÷ (30 × 8.33) = 133.7 sq. ft. of radiation. From this we will need 46,780 ÷ 133.7 = 350 boiler horse power to supply the deficiency. Because of the very safe figure taken in the amount of exhaust steam, it is readily seen that a 300 H. P. boiler would be sufficient. This would be installed in addition to the other boilers that are used as steaming boilers.

By Fig. 1 it will be seen that the minimum load on the steaming boilers carries through six hours out of the entire day and that the load at this time is approximately 50% of the maximum. At such a time the exhaust steam drops to 22,890 lbs. per hour and, since the calculations were baser upon 35,000 lbs. per hour, we have only 66% of this radiation supplied. Again, the economizer service is reduced 50% we have then, 0.33 × 112,000 + 0.50 × 25,720 = 48,820 sq. ft. of radiation to be cared for by some other means during the six hours.

This may be by heating boilers, and would require 49,820 ÷ 133.7 = 372 boiler horse power. One additional boiler may be added for this purpose or one or two of the steaming boilers may be piped for both steaming and water service. When the steaming requirement is low,

these boilers may be turned into the heating system as heating boilers.

ESTIMATES OF COSTS IN HEATING PLANTS

One of the first investigations toward centralization should be to make an estimate of the initial cost of the centralized system as compared to those of the independent ones that will be replaced. The following gives what may be taken as a close average value for such a plant. The installation expense of the hot water central station system is much greater than that for steam and is for that reason used for comparison, in this case. If a saving could be shown on this type of system, then the steam system would show much more saving in first cost and depreciation.

CONDUITS. (TWO PIPE.)

Installed complete, not including expansion joints and not including the cutting of pavements.

Length of Conduit, in Inches	Length of Run, in Feet	Average estimated cost of four kinds of conduit per foot in length dollars	Total Cost, dollars
12	100	7.31	731.00
10	500	6.12	3,060.00
8	1500	4.75	7,125.00
6	5000	3.47	17,350.00
5	2000	3.00	6,000.00
4	7000	2.12	14,840.00
3	2000	1.76	3,520.00

Total cost of all conduits.	$51,926.00
264 service connections, (see Private Plants) average $25.00	6,600.00
Expansion joints, one 10 in., five 8 in., sixteen 6 in., six 5 in., twenty-three 4 in. and six 3 in.	2,000.00

POWER PLANT

Four horizontal reciprocating pumps (60,000 gal. each), at $1,500.00, installed	6,000.00
Two 1,000 sq. ft. condenser-reheaters, installed	3,000.00
One co-mingler (barometric condenser) installed (1,500 lbs. steam per hour)	900.00
Economizer, 6,500 sq. ft., installed	8,000.00
One 300 H. P. water tube boiler for heating, installed	3,000.00
Other piping in plant, separators, etc.	5,000.00
Additional building and land.	5,000.00
Total for all conduits and plant	$91,426.00

PRIVATE PLANTS

Assume the average residence to have 700 sq. ft. of hot water radiation exclusive of mains and risers, then the centralized system will replace 264 private plants, and the estimated cost for each plant will be about as follows:

1,500 sq. ft. boiler and foundation	$150.00
700 sq. ft. cast-iron radiation	160.00
Pipes, valves, fittings, hangers, and ceiling plates	65.00
Specialties and sundries..	40.00
Labor, painting and bronzing	85.00
Total for one plant	$500.00
Total for 264 plants	$132,000.00

From the above we are able to make economic comparisons between the single and the multiple systems for installation, depreciation and interest, and operation. Let coal cost $6.50 and $2.00 per ton respectively for private and central plants. Let the heating year be 5,040 hours, and let the depreciation be 6%, and the repairs

and interest upon the investment be 8%, then we obtain the following:

TABLE SHOWING COMPARATIVE COST OF CENTRAL HEATING PLANT AND A CORRESPONDING NUMBER OF PRIVATE PLANTS

	264 Private Plants	Central Plant
First cost of plant	$132,000.00	$91,426.00
Depreciation at 6% for 5 years	39,600.00	27,427.80
Repairs, interest, etc., at 8% for 5 years	52,800.00	36,570.40
Cost of labor for operating for 5 years, of 210 days each year, 1 hour per day, at 30 cents per hour	83,160.00	
Salary and labor for operating 5 years, of 210 days. Salary for one-half man $4,500, the other half charged to power plant. Labor four men for 5 years, $12,000		16,500.00
Cost of coal. Each private plant 12 tons per year at $6.50 for 5 years	102,960.00	
Cost of coal at central plant, $2.00 per ton, all direct firing, no exhaust steam, for 5 years		80,470.40
Cost of coal at central plant. Estimated 71 tons needed, total, $2.00 per ton, zero day, 50% charged to the heating system, the balance of the heating being cared for by the exhaust steam		71.00

It is assumed in the above that a good grade of hard coal is used in the private plant and that a medium grade of soft coal is used in the central plant. This is a resonable distinction because of the better facilities for burning the cheaper coals in the large furnace units.

In determining the fuel cost of the private plants it was not worked out from a theoretical basis, but an average was taken from a number of plants of about the size of the one in our study.

In determining the fuel cost of the central plant it was worked out theoretically, but in this also it is possible to obtain only an approximate result. In the first place the outside temperature is continually changing, and the temperature of the water in the conduit has to be changed to suit these outside temperatures, hence the conduit losses vary greatly. In the second place, labor and fuel costs are so interrelated in the various parts of the power and heating plant that it is difficult to apportion them.

Concerning the outside temperature changes, the government records for the lowest average temeperature for 7 months, beginning October 1 and ending May 1, in the locality where the writer lives (Indiana), during the 20 years preceding 1910, was 32°. If, now, the radiation be figured for an outside temperature of zero degree, the ratio of the heat loss on the average day compared to that of zero weather is $(70 - 32) \div 70 = 0.54$. The following, then, figured upon this basis, may be taken as a fairly close estimate for the value of the coal used in five years' direct firing. Where no exhaust steam is used, $184,500 \times (30 \times 8.33) = 46,125,000$ B. T. U. per hour to heat the district on a zero day. 54% of this value gives 24,907,500 B. T. U. per hour for the average day. If coal is worth 13,000 B. T. U. per pound, and the furnace is 60% efficient, we have $24,907,500 \times 24 \div (13,000 \times 0.60) = 76,638.48$ lbs. of coal needed for the average day. For 210 days per year for five years, and with coal at $2.00 per ton, of 2,000 pounds, this gives $80,470.40.

Suppose, now, for argument, that the exhaust steam would be credited for part of this heating. Our typical plant gives the following amounts, exclusive of that used in the circulating pumps, which is charged to the heating system as direct firing.

EXHAUST STEAM AVAILABLE

Power Units.	1,490	× 6 =	8,940
	7,452	× 3 =	22,356
	8,197	× 4 =	28,788
	23,100	× 5 =	115,500
	18,630	× 6 =	111,780
	24		286,364
City Supply Pumps	8,680	× 24 =	208,320

Total, all exhaust steam excepting that from the circulating pumps, 494,684 lbs. per day. This amount of exhaust steam per day is equivalent to 20,611.83 lbs. per hour, providing it could be evenly distributed throughout the 24 hours of the day. With 3.2 sq. ft. of radiation supplied by 1 lb. of exhaust steam, we have 20,611.83 × 3.2 = 65,957.87, and this for the average hour in the heating year would be 65,957.87 ÷ 0.54 = 122,144 sq. ft. of radiation supplied by the exhaust steam.

Then 122,144 ÷ 184,500 = 0.662. This shows that there would be enough exhaust steam, if it could be distributed to suit the outside conditions, to supply 66% of the entire radiation in this plant on an average day. On a zero day this is 65,957.87 ÷ 184,500 = 35.7%.

The economizer, on an average day, will supply 26% and on a zero day, 14%.

The above exhaust steam and the economizers combined will supply 92% and 50% respectively of all the radiation on an average day and a zero day.

The fuel cost of heating 1 sq. ft. of radiation (direct firing) for one heating year of seven months with coal as above is 184,500 × 250 × 5,040 × 0.54 × 200 ÷ (13,000 × 0.60 × 2,000) = 8.8 cents.

At this point President Rogers announced the following committee appointments:

NOMINATING COMMITTEE

H. G. Powell, Springfield, O.
Geo. W. Wright, Baltimore, Md.
E. J. Kiefer, Easton, Pa.
Geo. D. Higgins, Detroit, Mich.
D. D. Hayward, Sedalia, Mo.

The next paper was entitled "Advantages to Be Derived from the Combination of Heating and Power Business for the Central Station," by R. D. DeWolf.

MORNING SESSION, JUNE 3

The first business at the Friday morning session was the report of the nominating commitee, which was read by H. G. Powell, chairman. This committee presented two tickets. A motion was made that the secretary be instructed to cast one ballot for the nominees on the first ticket presented. An amendment, offered by A. S. Armagnac, was carried, providing for a ballot on both tickets.

President Rogers appointed as tellers W. S. Pooley, of Toledo, and R. R. Walcutt, of Columbus. The result of the ballot was the election of the following, whose names appeared on the first ticket presented, and whose election was thereupon made unanimous:

NEW OFFICERS

President, George W. Wright, Baltimore Refrigerating and Heating Co., Baltimore, Md.

First vice-president, A. D. Spencer, Central Heating Co., Detroit, Mich.

Second vice-president, W. J. Grambs, Seattle Electric Co., Seattle, Wash.

Third vice-president, Warren Partridge, Springfield Light, Heat and Power Co., Springfield, Ill.

Secretary-treasurer, D. L. Gaskill, Greenville, O.

Members of executive committee: A. C. Rogers, Toledo Railways and Light Co., Toledo, O.; E. J. Kiefer, People's Consolidated Gas Co., Easton, Pa.

The election of officers, on motion of Charles R. Bishop, was then made unanimous.

President-elect Wright was called upon for a few remarks and was heartily acclaimed as he rose to address the convention. In a few happy words Mr. Wright declared his ap-

preciation of the honor conferred upon him and said that he would know no east, west, north or south in the conduct of the affairs of the association. He expressed the hope and prophecy that before another convention the membership would be double the present figures.

The retiring president, Mr. Rogers, thanked the members for the support that had been given him and pledged the loyalty of the Ohio members in the furthering of the association's interests.

The report of the committee on convention time and place was then presented by R. D. DeWolf, chairman. The report called for a vote on the question of holding the convention in the east or west. On motion of President-elect George W. Wright, it was voted that the report of the committee be accepted and a ballot taken as to whether the next convention should be held in the east or west, and that the date and convention city be left to the discretion of the executive committee. The ballot, which followed, resulted overwhelmingly in favor of the east.

This disposed of the business of the convention and Byron T. Gifford then read a paper on "The Profitable Operation of a Central Station without the Assistance of Electrical or Other Industries."

Owing to the lateness of the hour the session adjourned at this point until afternoon.

Before adjournment, however, the president named the following committees:

COMMITTEE ON PUBLICITY

Charles R. Bishop, Lockport, N. Y.
Byron T. Gifford, Chicago.
Joseph Graham, New York.
Harry de Joannis, Chicago.
W. W. Macon, New York.
A. S. Armagnac, New York.
W. B. Weaver, New York.
F. R. Low, New York.

COMMITTEE ON RADIATION

W. K. Martin, Crawfordsville, Ind.
G. D. Bly, Toronto, Can.
A. C. Rogers, Toledo, O.
Geo. D. Higgins, Detroit, Mich.
E. J. Kiefer, Easton, Pa.

COMMITTEE ON METERS

J. F. Lewis, Detroit, Mich.
D. D. Hayward, Sedalia, Mo.
H. G. Powell, Springfield, Ill.
R. D. DeWolf, Rochester, N. Y.
Grant Miller, Toledo, O.

Provision was also made for the appointment, by the new president, of a committee on programme, to arrange for and edit the papers to be presented; also for a committee on membership.

AFTERNOON SESSION, JUNE 3

The afternoon session was opened by the reading of a paper on "The Factors that Enter into the Cost of Generating and Distributing Steam for Heating," by Charles R. Bishop, Lockport, N. Y. This was followed by a paper on "The Relative Efficiency and Resistance to Corrosion of Different Types of Radiators," by Herbert Orr, Cleveland, O.

Prof. R. H. Fernald, United States Geological Survey, Case School of Applied Science, Cleveland, O., delivered a lecture, illustrated by lantern slides, on "Coal Production and Consumption."

Following the discussion of this lecture the convention adjourned, although many members stayed over until the evening to attend a lecture given under the auspices of the Ohio section of the American Institute of Electrical Engineers, by J. H. Boyden, of Washington, D. C., entitled, "Automatic Block Signaling for Electric Roads."

Calculations for Heating a Concrete House

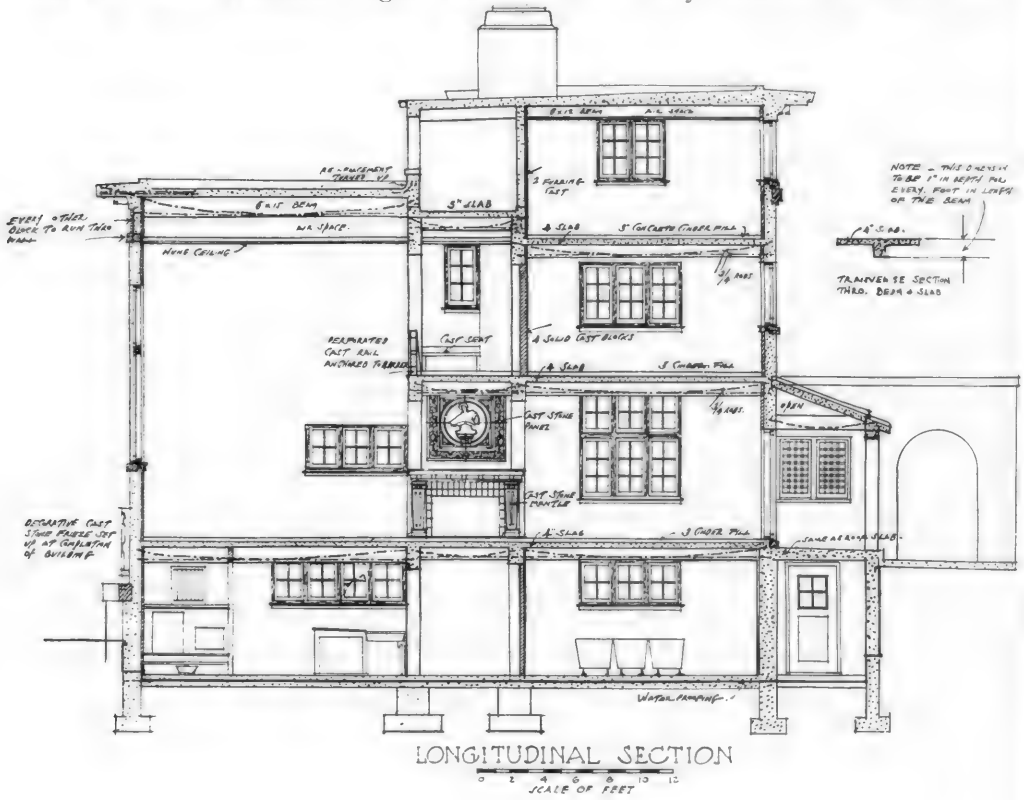
By Daniel R. Bacon,
Consulting Engineer.

The writer will endeavor in this article to give in detail the methods and formulæ used in the calculations for a heating system, of the type described herein, for a concrete house, plans of which are shown in the accompanying illustrations.

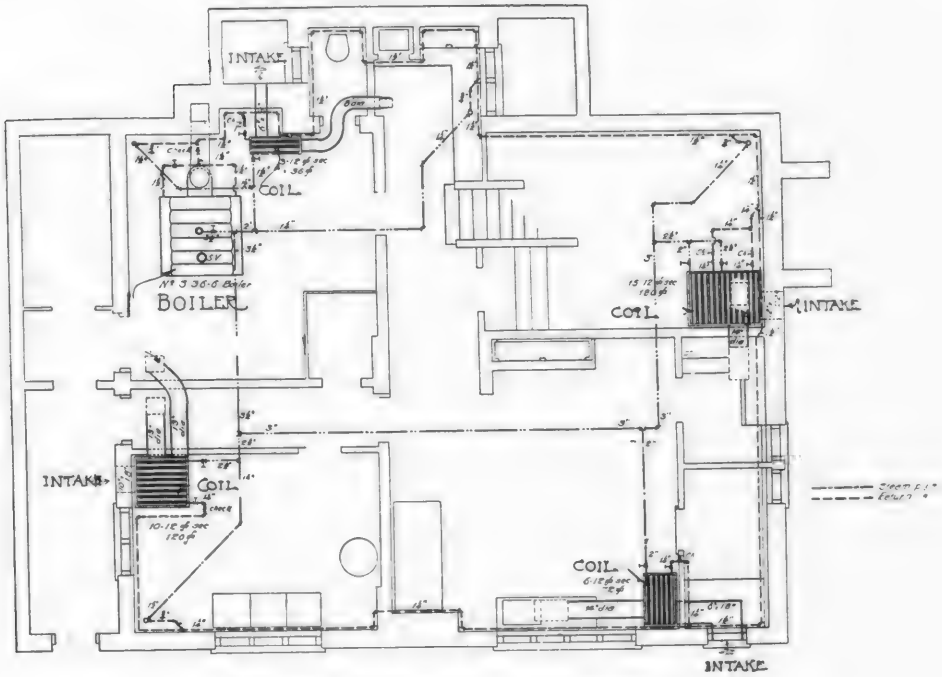
A COMBINATION DIRECT AND INDIRECT SYSTEM USED

The system of heating selected for this house is a combination of a direct and indirect low pressure steam system. This system was selected, first, in order to obtain a supply of fresh warm air on the first floor, which could not have been accomplished with direct radiation only. A system of direct-indirect radiation with fresh air inlets back of each radiator might have been used but that system not only mars the exterior appearance of the house but also is not nearly as reliable a mode of heating as the one employed. Second, an entirely indirect system was not chosen as this would have materially increased the cost of the plant, and while it was the intention to design as nearly a perfect plant as possible, it was not desirable to call for one which would be prohibitive by reason of its first cost. Third, by the use of this system as designed all radiators, which are always more or less unsightly, have been eliminated from the first floor rooms, being placed only in the sleeping rooms, etc., above the first floor.

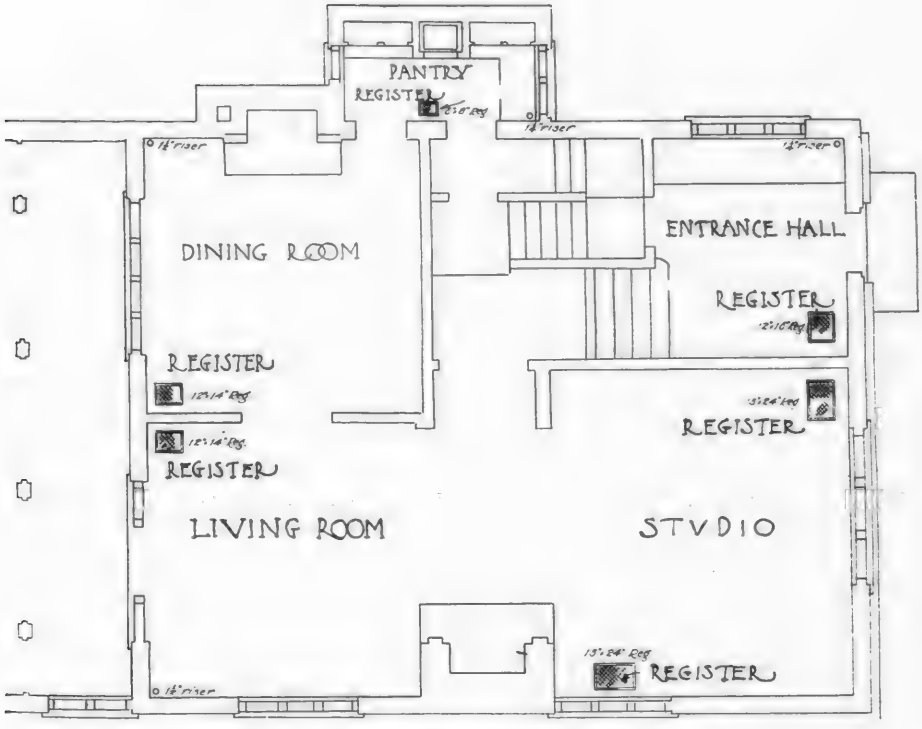
In this house a one-pipe system for all direct radiation is used, as this not only reduces the cost, but



Squires & Wheeler, Architects LONGITUDINAL SECTION—CONCRETE HOUSE



BASEMENT HEATING PLAN, CONCRETE HOUSE



FIRST FLOOR HEATING PLAN, CONCRETE HOUSE

also cuts in half the number of risers showing through the first story. From the heel of each riser in the basement is run a ¾ in. drip to the return main. This easily carries away all condensation from the radiators above and does not require the water of condensation to flow in the mains against the current of steam.

As the condensation per square foot of radiating surface is so much greater in an indirect radiator than in a direct one there has been provided a separate return branch, of ample size to free the radiator quickly of all condensed steam from each indirect stack to the return main.

METHOD OF CALCULATING RADIATION

The radiation for this house was figured on the British thermal unit basis.

The conditions imposed upon this plant were to maintain a temperature of 70° F. in all of the rooms, except the pantry, which was to be kept at 60° F., with an outside temperature of zero.

The construction of the building is of concrete with 8-in. walls, single windows being used throughout.

The transmission value for an 8-in. concrete wall is 0.41 B. T. U. per degree difference; for the glass surface 1.22 B. T. U.; for doors 0.414 B. T. U.; for the ceilings 0.1 B. T. U., and for air 0.02 B. T. U.

Taking the various rooms in the house and tabulating the quantities of exposure, etc., is the first process in the calculation. The method of tabulation as shown herewith has been found by the writer to be very convenient.

These results for the various rooms were obtained by the following method:

Living Room	B. T. U.
Glass surface 102x70x1.22	= 8,710
Exposed wall 163x70x0.41	= 4,678
Total B. T. U. loss per hour	13,388

HEAT LOSSES FOR THE OTHER ROOMS ON THE FIRST FLOOR

As these roms are heated entirely by hot air, a sufficient quantity of air must be admitted at a temperature sufficiently above the room temperature to maintain the conditions desired. It is first necessary to find the temperature at which the air must be admitted. This is found by the following equation:

$$\frac{13{,}388}{11{,}760 \times 0.08 \times 0.2375} = \text{drop}$$

in which

13,388 = heat losses in B. T. U.
11,760 = cu. ft. of air supplied per hour (six changes).
0.08 = weight of a cubic ft. of air at the average temperature.
0.2375 = specific heat of air.
drop = range of temperature through which the air must drop.

In this case the equation reduces to 58°, or we will use a uniform drop of 60°. This means that the air must be heated 60° above the room temperature or to 130°.

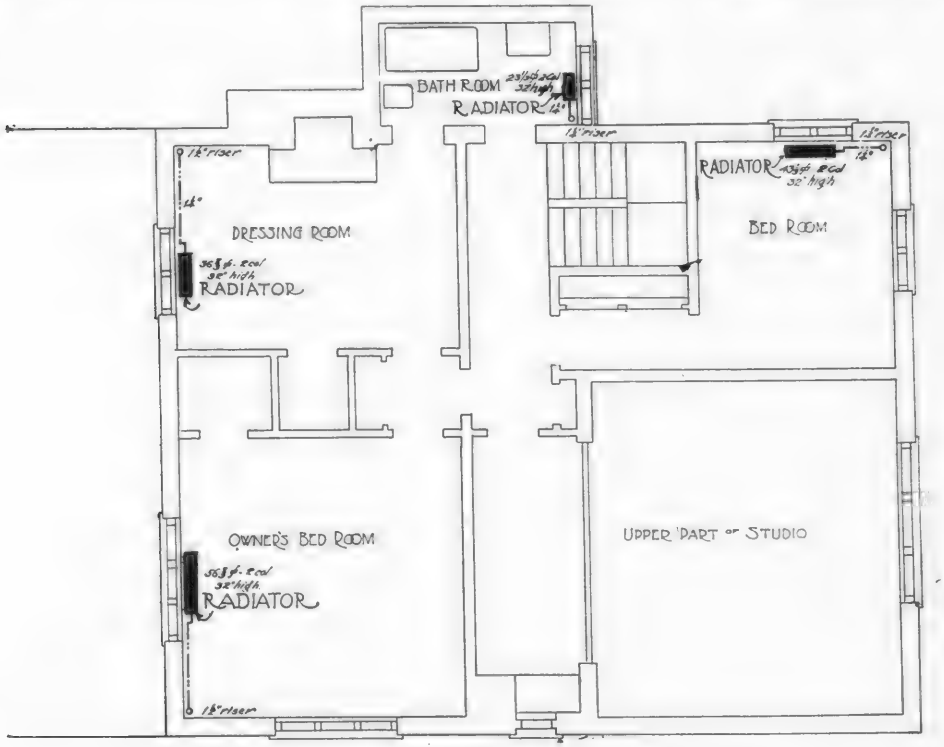
The heat required to raise this amount of air from zero to 130° is found as follows:

FIRST FLOOR ROOMS

Room	Contents Cu. ft.	Glass Surface sq. ft.	Wall Surface sq. ft.	Doors sq. ft.	Temp. Req'd. O° F.	B.T.U. losses per hour	% added	Total B.T.U. per hour	Radn. factor	Sq. ft. Radiation
Living Room..	1960	102	163	.....	70	13,388	.....	13,388	.....	60
Dining Room..	1960	63	163	.....	70	10,050	5% 502	10,552	.....	52
Pantry.....	520	25	155	.....	60	5,643	10% 564	6,207	.....	31
Entrance.....	1570	39	215	28	70	10,303	15% 1545	11,848	.....	59
Studio.....	5715	134	443	.....	70	24,158	10% 2416.	26,574	.....	131

11.760x0.08x0.2375x130=B. T. U. which reduces to 29,047.

The next step is to obtain the necessary amount of radiation to give off this heat. As in this plant steam at atmospheric pressure will be used, the temperature of which is 212°, and as the average temperature of the air surrounding the radiator sections is 65° each square foot of radiating surface will give off 440 B. T. U., for an indirect



SECOND FLOOR HEATING PLAN—CONCRETE HOUSE

radiator will give off 3 B. T. U. per degree difference in temperature between the steam and air, or (212—65)3=441.

Then as the total heat units required per hour are 29,047 and as each square foot of surface will give off 440 heat units, then

29,047÷440=66 sq. ft. of surface required.

For the other rooms on this floor the same temperature drop as given above has been used and the air quantities varied to suit the conditions.

By referring to the basement plan it will be seen that in laying out the work the calculated sizes were adhered to as nearly as possible, with the exception of the large stack of 180 sq. ft. which supplies the entrance hall and one-half of the air for the studio. This stack was increased considerably to care for the air leakage and consequent loss of heat due to opening the doors. The writer has found it good practice to always double the calculated amount of radiation for halls and rooms of this class when the leakage is great.

In the matter of cold and warm air connections to and from the indirect stacks it has been found that in sizing these ducts a very safe rule is to allow in the hot air connection 2 sq. in. cross sectional area for each square foot of radiation and for the cold air pipes 1½ sq. in.

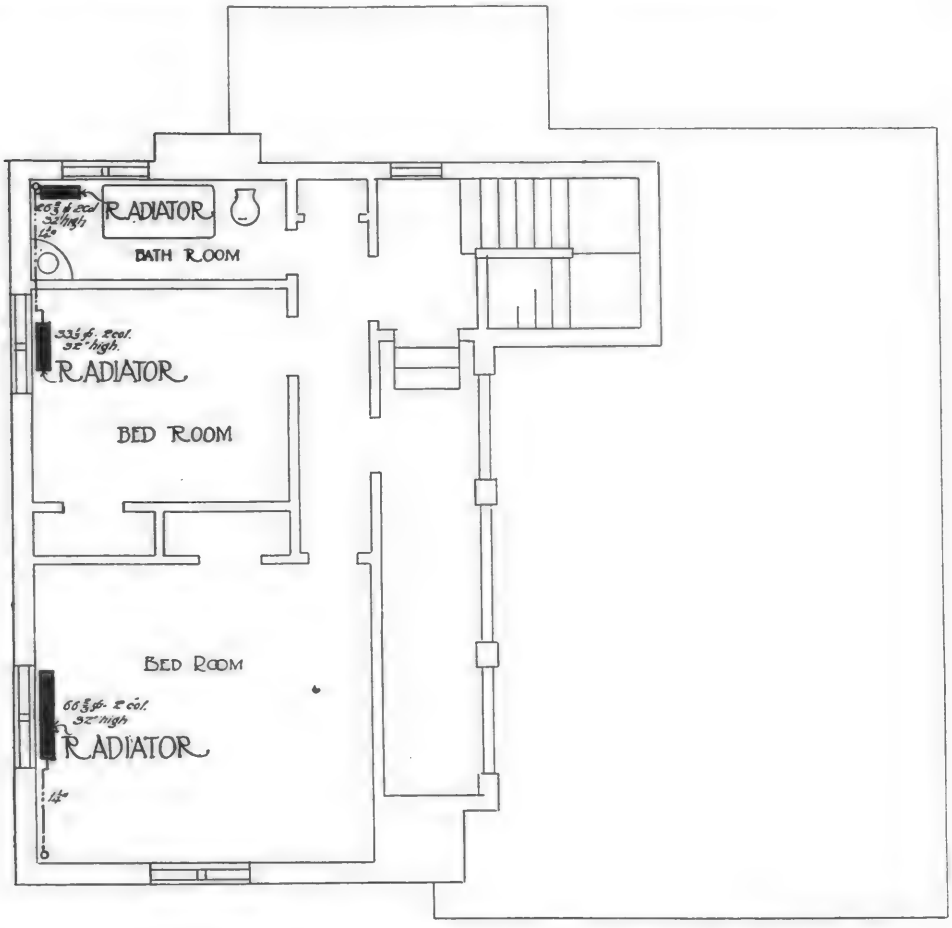
The galvanized ironwork for this house was figured out along these lines, being checked to see that the velocity did not exceed 300 cu. ft. per minute. In determining the

size of registers it is good practice to use a register whose size is from 25% to 33 1-3% greater than the area of the flue connecting thereto.

In calculating the amounts of direct radiation used above the first floor, the same transmission values were used as above described. The difference in the method of calculating direct and indirect radiation lies in the fact that, with the former, no air is admitted to the room except through the opening of doors or windows and through natural leakage. It is, therefore, customary in this country to allow enough extra heating surface to care for one air change per hour.

Again, with the same steam temperature, 212°, but with the average temperature of the air surrounding the radiators at that of the room, or 70°, and with a lower transmission factor for the radiator it will be readily seen that the heating value of a square foot of surface is greatly reduced, thus: a square foot of direct cast iron radiation will give off 1.7 B. T. U. per hour and with steam at 212° and air at 70° we have

(212—70)1.7=241.4 B. T. U. per hour per square foot.



THIRD FLOOR HEATING PLAN, CONCRETE HOUSE

Therefore, after obtaining the total heat losses for the various rooms, including that due to air change, these results were divided by 240 to get the amounts of direct radiation required.

SIZING THE PIPES

Having now obtained the necessary amounts of radiation for the

various rooms the next step was to determine the sizes of the pipes connecting thereto.

The first to be considered were, of course, the risers. It is never advisable to run any pipe smaller than 1¼ in. where the steam and water of condensation have to flow in opposite directions; therefore, no matter how small the amount of radiation on a riser or main of a one pipe system when the steam and water oppose each other, a pipe smaller than 1¼ in. should not be used. For this house, pipes under the above conditions were sized according to the following list.

PIPE SIZES FOR A ONE PIPE SYSTEM

From 1 to 160 square feet of radiation, 1¼ in. pipe.

From 61 to 100 square feet of radiation, 1½ in. pipe.

From 101 square feet of radiation and upwards, 2 in. pipe.

For the mains in the basement, where the system is really a two pipe one the pipes have been sized according to the following list:

PIPE SIZES FOR A TWO PIPE SYSTEM

Amount of Radiation, Square Feet	Supply Pipe Diameter Inches	Return Pipe Diameter Inches
0 to 48	1	¾
49 to 96	1¼	1
97 to 149	1½	1
150 to 299	2	1¼
300 to 549	2½	1¼
550 to 999	3	1½
1000 to 1499	3½	1½
1500 to 1999	4	2
2000 to 2499	4½	2
2500 to 3599	5	2
3600 to 5000	6	2½

In sizing up the mains the indirect radiation was reduced to an equivalent of direct on the usual basis, which is about as three is to one, that is 1 sq. ft. of indirect radiation would condense three times as much steam as 1 sq. ft. of direct. Bearing this in mind, both for the supply and return, it is found to be a very simple matter by means of the above table to properly size the piping.

Totaling up the amount of direct radiation required we have 286 2-3 sq. ft. and an equivalent of 1,224 sq. ft. of indirect, making a total of 1,510 2-3 sq. ft.

It is not advisable to use a boiler of only sufficient size to care for this actual amount of radiation, as considerable heat is lost in transit through the mains. It is, therefore, customary to add 25% for the loss due to mains, which would bring this up to 1,888 sq. ft. Still another allowance of a third should be made to allow for a reserve capacity to take care of extreme weather conditions and variations in manufacturers' ratings. This would bring the rating up to 2,517 sq. ft. For the type of boiler selected 2,600 sq. ft. was the nearest size to this amount.

ANOTHER METHOD OF FIGURING THE BOILER

Another method of determining the size boiler to be used is as follows: Take the amount of direct radiation or equivalent direct and multiply this amount by the number of heat units given off from each square foot, divide this result by 2,250 for house heating boilers, and the result obtained is the square feet of fire surface which should be in the boiler selected. The 2,250 used above is the amount of heat in B. T. U. which will be transmitted to the water in the boiler for each square foot of fire surface. Taking, for an example, the case in question, the equivalent direct radiation including mains is 1,888, and the B. T. U. given off for each square foot is 241; then $\frac{1888 \times 241}{2250}$ = 202.2 sq. ft. of fire surface. The increase of 25% over this is not necessary, but may be added, if desired, to care for unforseen emergencies.

A good point to be borne in mind in selecting a boiler is that the boiler should have as great a proportion of its heating surface as possible direct surface, that is, surface which is directly exposed to the fire. In boilers in which long

flues are used and which contain a great amount of indirect surface, the gases are so cooled off on reaching the end of the smoke passage as to be absolutely worthless and even, in some cases, are found to be below the temperature of the water.

All piping which is exposed in the basement should be covered with a heat insulating covering in order to prevent the loss of heat at this point. In some cases it is desirable to have this heat in the basement to keep it dry, in which case the covering is omitted. The boiler itself should be covered with a good asbestos cement if it has no heat insulating device when it comes from the factory, as this is a point where there is a large loss in heat. If the boiler is properly covered, a large portion of this heat is utilized in the production of steam, thereby keeping down the operating cost.

The construction of the outside walls of a building is the factor which determines the transmission value to use in calculating the amount of heat required to heat a building. The following table gives this factor for different kinds of wall construction.

TYPE OF CONSTRUCTION	FACTOR
8-in. brick wall	0.458
8-in. brick wall, with furred air space and plaster on inside	0.23
8-in. concrete wall	0.41
Hollow tile and stucco	0.2
Good wood frame construction	0.26

From this table it is seen that a house with brick walls and no air space between brick and plaster requires the greatest amount of heat to keep it warm. By having an air space between the walls and the plaster, the amount of heat required is materially reduced. A concrete house requires slightly less heat than the plain brick construction. A house constructed of hollow tile and stucco requires the least heat and, therefore, will be less expensive to keep warm than the same house built of other materials. Concrete hollow blocks give about the same results as hollow tile construction.

Elimination of Dust in Residence Heating

Design of Heating and Ventilating System for Home of Ludwig Nissen, Brooklyn, N. Y.

The problem of warming and providing a certain amount of fresh air for a private residence is one that is often handled in a very unsatisfactory manner. Where the warmed air is brought into the various rooms of the house through flues and registers there is a tendency to provide a net work of dust collecting flues and ducts in the basement of the building. This is wrong in principle and bad in practice. Horizontal flues are bound to collect dust. Their use, therefore, should be reduced to a minimum and, in fact, they should be practically eliminated in the design of the apparatus.

The accompanying drawings show the arrangement of the apparatus in the residence of Ludwig Nissen, on St. Marks Avenue, Brooklyn, N. Y., where the horizontal dust collecting flues and ducts in the basement are in most cases conspicuous by their absence.

The indirect heaters are located in three compartments or rooms, which may be called cold air settling chambers. The air from out-of-doors enters these rooms through windows which are provided with screens and dampers. The indirect heaters are supported on stands from the concrete floor.

There is a hood of heavy galvanized iron above each heater and this hood is connected to the warm air flue. The hoods, as well as the short connection to the flues above the indirect heaters, are accessible through large size cleanout doors; while the bottoms of the indirect heaters are entirely open.

The cold air settling chambers are so arranged that they can be easily cleaned.

The boiler itself is located in the

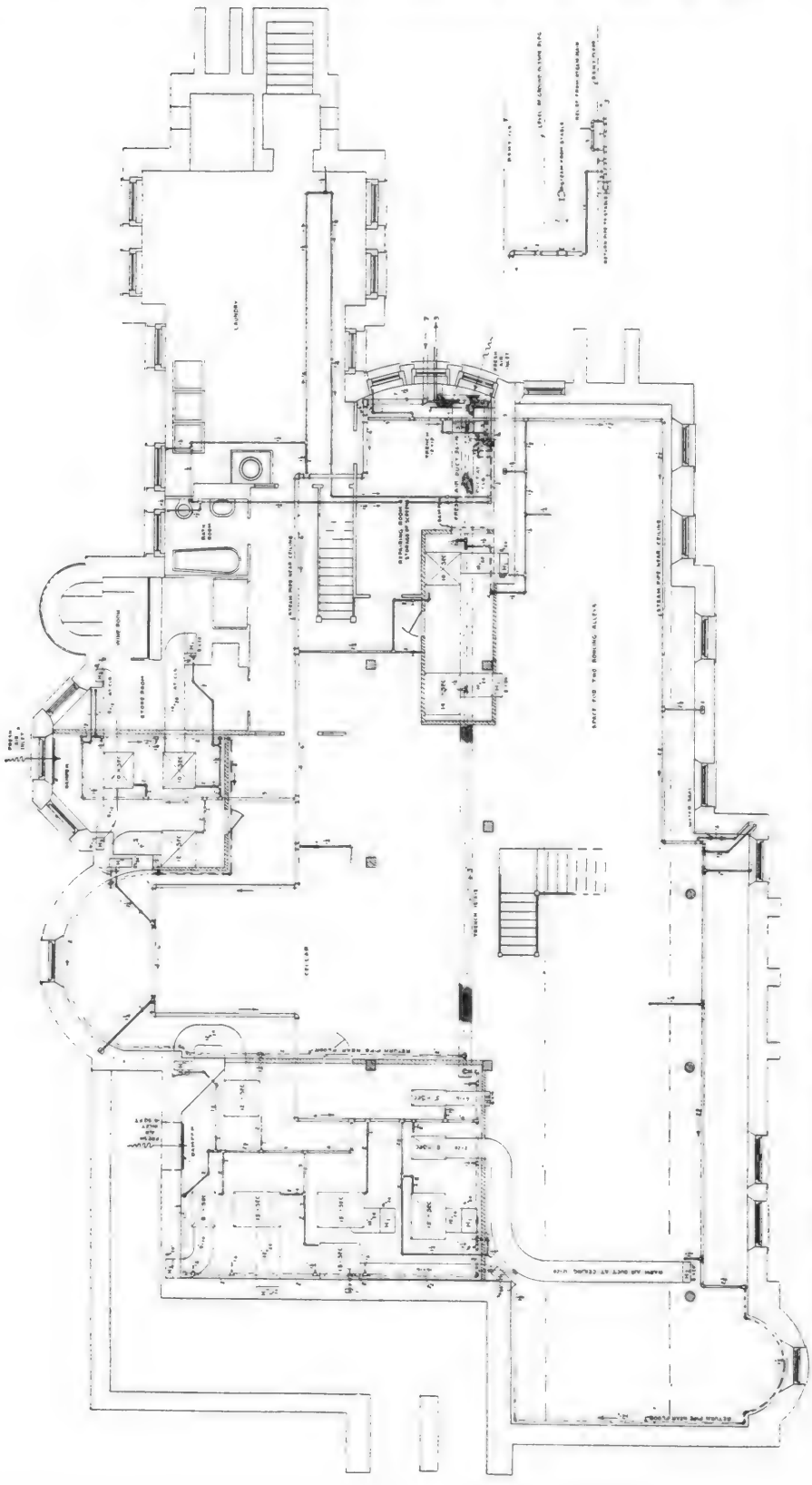
RESIDENCE OF LUDWIG NISSEN, BROOKLYN, N. Y.

basement of the stable building, the general arrangement of the steam piping from the stable to the residence being shown in the block plan. The plan shows a short tunnel from the stable building and straight pipe conduit for the steam and the return pipes from the tunnel to the residence, thus making it possible later on to withdraw and reinsert, if necessary, new pipes from the residence to the tunnel. The tunnel also allows for pipe expansion from the residence toward the stable.

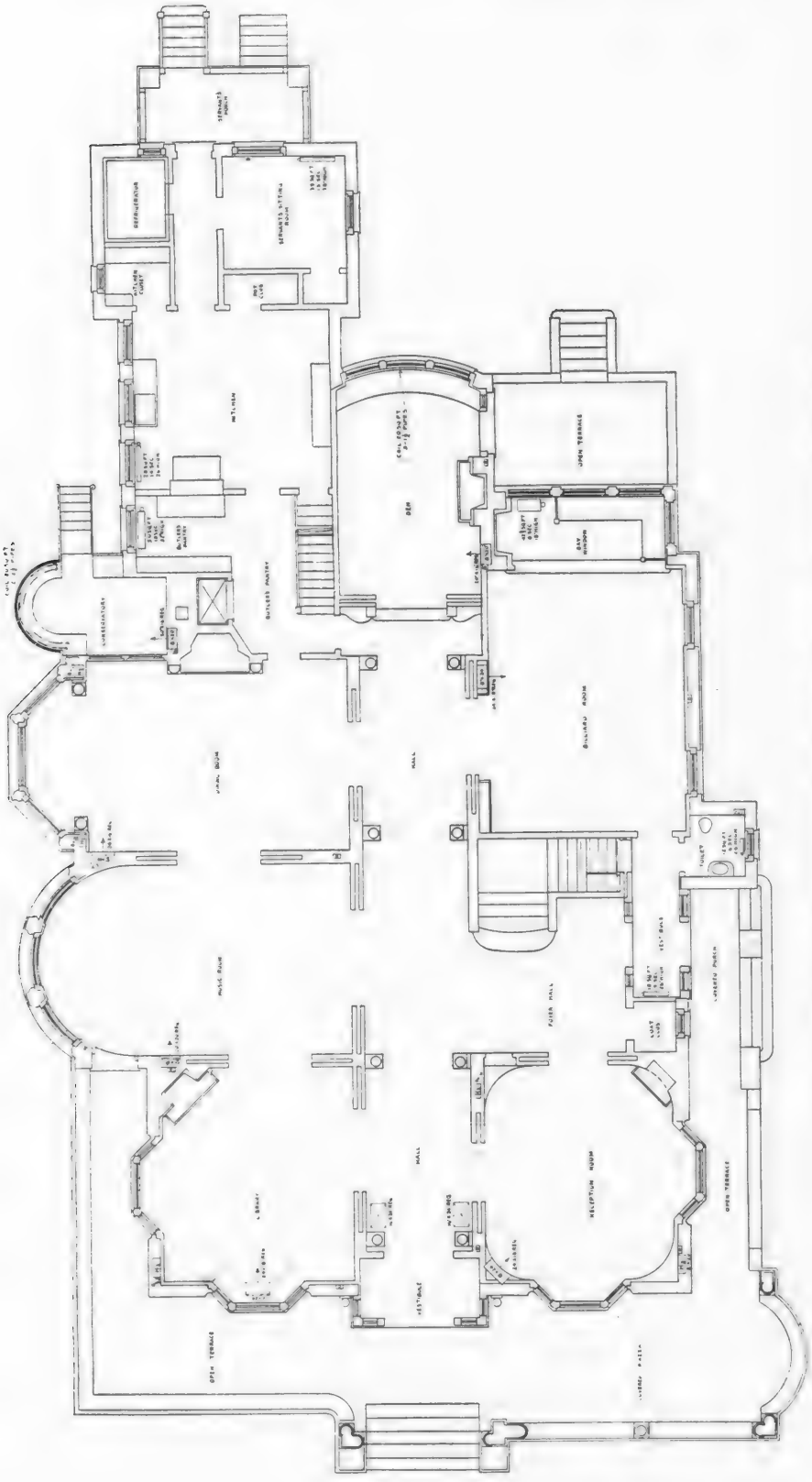
The small detail at the right of the basement plan shows the arrangement of the steam and return pipes where they enter the residence. The steam pipe is carried from the stable to the residence with a downward pitch. It is provided with a suitable relief pipe at the entrance to the residence. The steam pipe is then reduced in diameter and carried to the ceiling of the basement, from which point it is run about as shown by the plans.

The return pipe is carried for some little distance through a trench. This pipe is provided with a water sealing loop arranged as shown on the small detail. The reason for the use of this loop is the fact that the level of the return

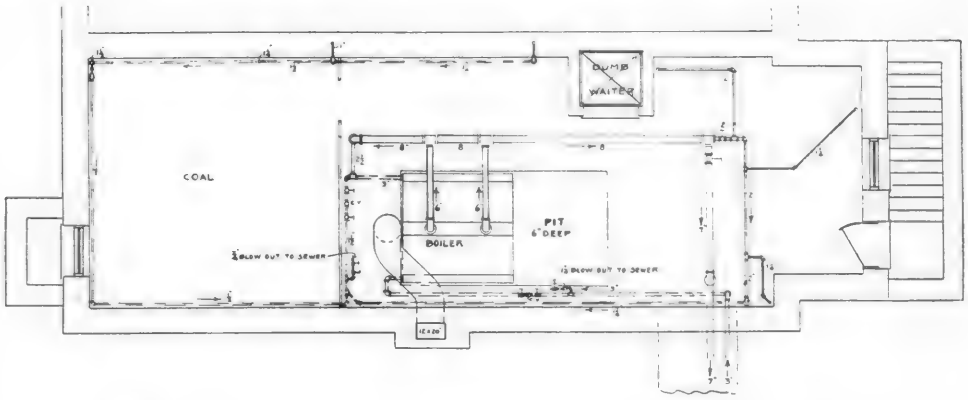
BLOCK PLAN OF HEATING AND VENTILATING SYSTEM, RESIDENCE OF LUDWIG NISSEN



BASEMENT PLAN, RESIDENCE OF LUDWIG NISSEN, SHOWING METHOD OF GROUPING HEATING AND VENTILATING APPARATUS



FIRST FLOOR PLAN, RESIDENCE OF LUDWIG NISSEN, SHOWING REGISTERS



PLAN OF BOILER ROOM IN STABLE, RESIDENCE OF LUDWIG NISSEN

pipe in the trench is not far from the level of the water line in the boiler.

The rooms generally throughout the residence are heated by air from the indirect heaters, controlled by thermostatically operated dampers. The air discharge from the various rooms of the residence is largely cared for by the fireplace flues which have been provided and take the place of vent flues in most of the rooms. In this connection it may be pointed out that a return circulation can easily be provided by letting the cooler air from the halls, etc., pass through registers directly into the cold air settling chambers.

The system itself is a low pressure steam heating gravity apparatus provided with an air line.

An interesting feature of the installation is the way in which the air valves from the indirect heaters are connected to the air lines near the ceiling of the basement; the indirect heaters themselves being lower than the air line into which they discharge. The method used is to carry, from the indirect heaters to a point above the air line, a pipe ½-in. in diameter. To the top of this pipe the air valve is connected. If the pipe from the indirect heater to the air valve itself is made very small, the condensed steam will not fall back into the indirect heater. It will cool and it will then be pushed through the air valve, thus causing a continuous drip and waste. If, however, the pipe from the indirect heater to the air valve is made of reasonable size, any steam which condenses within this pipe will pass back to the heater and will not pass through the air valve.

Direct radiation is provided in some of the rooms, especially near the top of the residence, in the stable, and in the servants' quarters which are located above the stable itself.

The consulting engineers who designed the apparatus were William J. Baldwin and Ralph C. Taggart. The contractors for the heating and ventilating apparatus were Baker, Smith & Co., of New York. The architect was Arne Dehli, of New York.

Consul-General Robert P. Skinner has looked into the opening in Germany for American suction cleaning apparatus, and writes from Hamburg:

Catalogues and printed information in regard to vacuum cleaners of American manufacture having been shown to an extensive importer of miscellaneous American goods in Hamburg, have evoked the opinion that prices and terms being satisfactory these devices should be able to compete successfully with German and other machines now on this market. This informant was particularly struck by the compactness and apparently practical construction of the motors shown in the American designs and with the variety of devices proposed by American manufacturers.

The extensive construction of large apartment houses and immense office buildings in the larger cities of Germany make the use of central suction plants with connections in all rooms entirely practical

The Utilization of Waste Heat for Factory Heating

Fuel bills for heating factory buildings are apt to appear more exorbitant to the manufacturer than an equal expenditure for power, which, to a certain extent, may be considered a more tangible product of fuel than mere heat. Many factories have some waste heat from their various manufacturing processes, which may be utilized for heating purposes. The question of how to economically use such heat is a problem which as a rule must be solved for each individual plant. However, the study of installations which have successfully utilized waste heat may often suggest features which may be applied advantageously to proposed heating plants.

The Massachusetts Fan Co., of Watertown, Mass., which for years has made a particular study of heating problems, has recently installed an interesting plant of this character for the Universal Carbon Co., at Ashland, Mass. This installation is designed to serve a twofold purpose; to utilize the waste heat from the carbonizing ovens to heat the buildings in winter; and to carry away the heat from the carbonizing room in the summer time.

The buildings consist of a one-story section 280 ft. x 51 ft. in one end of which is located the carbonizing room 75 ft. long, and a three-story building 168 ft. x 55 ft. forming an ell with the one-story building. The total cubical contents are approximately 700,000 cu. ft. with about 33,500 sq. ft. of exterior wall surface.

There are eight furnaces in the carbonizing room in which oil is burned with insufficient air supply so as to make lamp black. The furnaces are approximately 5 ft. x 8 ft. x 5 ft. high, and the tops are covered with fire brick. As the temperature in the furnaces is in the neighborhood of 1,500° F., there is a considerable loss of heat by radiation. The Massachusetts Fan Co. undertook to utilize this heat and by their apparatus to secure a temperature of 70° throughout the buildings in zero weather.

The method employed is as follows: Over each furnace was installed a galvanized iron hood 5 ft. x 8 ft. square, which can be raised or lowered as may best suit the conditions of operating. These hoods are connected by 16-in. ducts equipped with dampers to the main flue leading to the inlet of a 100-in. full housed, top horizontal discharge blower, capable of delivering about 20,000 cu. ft. of air per minute. The fan is driven by a belt from a 10 H. P. 220 volt, three phase, 60 cycle motor running at 1,200 R. P. M.

The furnaces are arranged in pairs, and the 16-in. collecting ducts enter the main flue on opposite sides, there being 23 inches between the first and second sets, 32 inches between the second and third, 39 inches between the third and fourth sets and 40 inches from these to the fan.

The distributing system consists of a 40-in. main duct of galvanized iron leading from the fan the full length of the one-story building and to the second floor of the three-story ell. Here three ducts branch off, 25-in. to the first floor, 26-in. to the second floor, and 23-in. to the top floor. The flues on each floor have 6-in., 8-in. and 10-in. outlets arranged to secure the desired distribution of heat, the main flues being reduced in size after each outlet.

A by-pass is arranged so that any part of the heat may be taken from the furnaces and delivered out of doors when not wanted for heating the buildings.

THE HEATING AND VENTILATING MAGAZINE

Vol. 7 June, 1910 No. 6

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
President A. S. ARMAGNAC
Secretary and Treasurer, G. PETERSEN
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, Editor — G. PETERSEN, Advertising Mgr.

European Representative:
AMERICAN PUBLICATION BUREAU, 46, Upingham Road, Leicester, England

Subscription, - - - - - $1.00 per year
Foreign countries, - - - - 1.50 " "
Back numbers, - - - - - 15 cents a copy

PROBABLY the most ambitious attempt yet undertaken to legislate pure air into buildings is that provided for in the proposed building code now under consideration in Chicago. Not only school and other public buildings are covered in the ordinance, but the requirements are considered of department stores, office buildings, hospitals, hotels, residences, theatres and even stables. Most of the ventilation legislation now on the statute books is confined exclusively to school buildings.

The code also takes into account the varying requirements in different classes of buildings and specifies a definite fresh air supply in each case in amounts averaging fairly close to the usual quantity of 1,500 to 1,800 cu. ft. per hour per person. In addition, the quality of the air in assembly rooms and similar apartments must come up to a standard of 10 parts of CO_2 in 10,000 parts of air, when taken at a point 2½ to 8 ft. above the floor and generally distributed. Moreover, the temperature in such spaces must not exceed 68° F. when artificially heated, and the relative humidity must be kept within 45% and 80%.

While no difficulty is presented in meeting the conditions of the code, the movement is easily the most important and far-reaching of its kind yet undertaken. If the ordinance is adopted, the idea will no doubt be taken up in other large centers and thus it should mark the beginning of a record-breaking growth in the business of heating and ventilation.

FOR enthusiasm, interest and attendance the National District Heating Association, at its second annual convention in Toledo, June 1-3, set a pace that not only shows the lusty health of this young organization, but marks the entry into the heating field of a power that is likely to grow with surprising rapidity. The impressions gained by attendance at this convention were unmistakable. The professional sessions, both in point of attendance and participation in the discussions, compared favorably with those of far older organizations and the fact that many of the delegates were from scattered points showed the wide field from which the association will draw its future membership. Moreover, the manufacturers, quick to see the vigor and promise already shown by the organization, were prominently represented, with exhibits that well merited and received the attention of the delegates.

To Ohio's district heating men belongs the credit for thus welding the interests of the central station engineers and they richly deserve it.

MECHANICAL EQUIPMENT

Notes on Modern Refrigeration

An unusually interesting review of the principles of refrigeration and the development of the refrigerating machine is contained in a paper by H. D. Pownall, read before the Ohio Society of Mechanical Electrical and Steam Engineers, at Cincinnati, May 19-20, 1910. The paper was entitled "Refrigerating Machinery and Applances," and is presented in part herewith:

Notwithstanding the numerous improvements made in the application of refrigeration and the resultant increase in the use of refrigerating machinery, it may be safely asserted that this province of engineering is yet far from being exhausted.

The value of mechanical refrigeration in such institutions as hospitals, sanitariums, morgues and the saving of life and health by the more general distribution throughout the year of fresh, wholesome foods cannot be estimated in money value; neither can its worth in the iron and steel industries, in chemical industries nor in the added comfort to humanity be computed. Its incalculable influence in the improvement of manufacturing and social conditions is gradually lost from sight, inasmuch as its benefits come gradually and are unconsciously accepted.

There is probably no other branch of engineering less thoroughly understood than that of refrigeration, this being partially due to the lack of printed matter or text books relating to this subject. And the lack of printed information is in a measure attributable to the fact that it is a very costly procedure to secure accurate data relative to this science. In electricity or other lines of engineering, a complete unit may be easily tested for both efficiency and characteristics at a moderate cost before shipment. An accurate test could not be made upon a refrigerating plant of any size for less than $1,000.00 and the data secured from this test in the majority of cases would be applicable to the one plant only.

Up to the present time, notwithstanding the wonderful strides which have been made, the various engineering bodies have failed to reach any definite conclusion as to what shall constitute a standard tonnage basis; that is, to establish a definite unit of refrigeration. The various manufacturers of such machinery therefore rate their product according to their own judgment.

PRINCIPLES OF REFRIGERATION

Mechanical refrigeration depends upon the now well-known fact that fluids in changing from a liquid to a gaseous state absorb heat, which, in turn, is given off on again resuming the liquid state. These different states are brought about by variation of pressure, due to the operation of a vapor pump (or compressor), which compresses or elevates the pressure of the gas to a point which will permit of its liquefaction. The heat produced by compression is removed by water flowing over or through a condenser, it being necessary to remove 1 B. T. U. in the condenser for each B. T. U. absorbed by the gas in evaporating, plus a slight addition due to the heat caused by compression and by friction of the gas in the piping system.

The liquid flows from the condenser to a receiver and from the receiver through a controlling valve erroneously called an expansion valve.

The pressure on the condensing side when using ammonia as a refrigerant varies from 125 to 200 lbs., dependent upon the size of the condenser and upon the temperature and amount of water available for condensing purposes. The liquid, during refrigeration, first flows as a liquid through the controlling valve, where its pressure is reduced from the condensing pressure of approximately 175 lbs. to that of the refrigerator, or about 15 lbs. The temperature of the liquid flowing to the controlling valve is about 90°F. and after expansion is about 0°F.

This reduction in the temperature of the liquid ammonia is caused by the evaporation of a portion of the liquid, which, owing to its latent heat, cools the balance of the liquid to the refrigerator temperature of 0°. Theoretically, under the above condition about 18% of the liquid is converted into gas at this point in cooling the remaining volume to the temperature of the balance of the liquid in the refrigerator, the variation in the two pressures being controlled by the rate of flow through the liquid valve and by the removal of the resultant gas with the compressor.

The refrigerating fluid is contained in coils of piping or in cylindrical vessels, similar to return tubular boilers. In an ice making system these coils or cylindrical vessels are immersed in a brine solution, this brine being caused to rapidly circulate around or through the piping system. The brine, being warmer than the ammonia, causes the latter to boil or evaporate. Ammonia boils at 29° F. below zero at atmospheric pressure. During this process the refrigerating agent absorbs from the brine a certain amount of heat which is conveyed to the compressor, the resultant gas being again elevated in pressure to a point sufficiently high to permit re-liquefaction; thus a continuous cycle is formed, consisting of three functions, performed by the following parts of the equipment: 1, the compressor, 2, the condenser, 3, the evaporator.

It will be noted that the refrigerating fluid continually repasses through all portions of the apparatus, which is, as far as practicable, hermetically sealed, the refrigerating medium being alternately evaporated and condensed. It takes up heat from the material to be chilled and transmits it to the water circulated over or through the condensing coils.

REFRIGERATING AGENTS

Many different volatile fluids are adaptable as refrigerating agents, but those which have proven most practical are anhydrous ammonia and carbonic anhydride. Although the same principle underlies the use of all such fluids, their physical properties vary and consequently demand different treatment to produce the best results. In so far as the user is concerned, these differences result in the varying volume of fluid to be circulated and in the variation in condenser and refrigerator pressures peculiar to each individual agent. These conditions, in turn, determine the dimensions and strength of apparatus used. The chemical action of the various agents demands the use of somewhat different materials in the construction of the various parts of the equipment with which the fluid comes in contact. At the present time ammonia leads the list in popularity, and in fact, has almost superseded other refrigerating agents.

The ordinary working pressures of the ammonia compression or absorption system are from 15 lbs. on evaporating side to 220 lbs. on the condensing side, while that of carbonic anhydride is about 300 lbs. on the evaporating and from 950 to 1,250 lbs. on the condensing side. It may be safely asserted, however, that in the United States there are now 199 ammonia compression plants sold to each carbonic anhydride system.

THE REFRIGERATING MACHINE

Owing to the peculiarity of the ice-making and refrigerating business it is essential that nothing but highest grade material and workmanship be used in the construction of such plants. This is due to the fact that it is necessary that a refrigerating plant operate continuously 24 hours per day for periods of 4, 5 or 6 months without interruption. In no other branch of engineering is such severe demand made upon the machinery. Interruptions in most manufacturing establishments, caused by defective machinery or through carelessness, do not usually result in such serious consequences as interruptions in a refrigerating and ice-making plant.

In most manufacturing plants a few hours' operation overtime will compensate for decreased production resulting from such delays, and it is possible through "the excuse department" to satisfy the customer for non-delivery of material. Such excuses, however, are of no avail in an ice-making plant. If your ice-box is empty, you rely upon your ice-man to replenish it; and if he is unable to do so, you are compelled to look to his competitor. The ice which he may bring to-morrow will be of no benefit to you to-day, consequently it behooves the intending purchaser of ice machinery to carefully examine and to purchase none but the best.

While there has been much discussion regarding the comparative merits of the vertical single acting and the horizontal double acting machine, at the present time there are but two concerns in the United States manufacturing refrigerating machinery who strictly adhere to the vertical type; all other companies make both the horizontal, double acting and the vertical single acting or only the horizontal, double acting machine.

One of the above companies will, in time, I predict, manufacture horizontal machines. At present 75% of the machines sold of over 5 tons capacity are of the horizontal, double acting type.

CORRESPONDENCE

Hot Blast vs. Direct and Indirect Heating

EDITOR HEATING AND VENTILATING MAGAZINE:

In the April number of THE HEATING AND VENTILATING MAGAZINE an article on "The Ventilation of Court Rooms and Halls of Justice," by William J. Baldwin, is due to excite comment, as he made many positive statements on ventilation that, perhaps, quite a few of us do not agree with. Under "How should a court room be ventilated?" the statement is made that "'the ventilating apparatus and the warming apparatus should not be the same." There are no reasons advanced why this should be the case, and, according to the accepted opinions in this part of the country (Illinois), they both should be one and the same when the quantity of volume of air admitted convey sufficient heat to supply the heat loss through the walls and windows at 0° F. and maintain a temperature of 70° F. in the room.

When air is admitted to a room and deflected upwards it diffuses and reduces in temperature until at the outlet register it leaves at the temperature of the room.

No hot blast is felt by the occupants of the room, or drafts, when the changes of air are not greater than seven or eight per hour. The temperature of the room may be kept constant at any desired temperature by thermostatic control and a combination of mixing dampers in the basement, while the volume of air admitted per hour remains constant. This system is well known and used extensively with excellent results.

When heating by indirect radiation alone there is a more uniform temperature in the room than by direct or a combination of direct and indirect, as the action of diffusion of the incoming air settles the temperature uniformly over the entire room by the circulation of the conveyor of heat, while the direct radiation, if placed in the room, is always close to the source of the greatest heat loss, *i. e.*, the exposed walls and windows. The temperature will be greater on the side of the room near the coils or radiators.

Again, I find occasion to disagree with the author when, under "Ventilation Necessary in Summer," it is stated, "in many of our hospitals there is a theory that windows cannot be opened when the ventilating apparatus is in use. If the ventilating apparatus is properly constructed this is not a fact, although it is often the case through improperly constructed heating and ventilating apparatus." Now, if Mr. Baldwin can describe such a system whereby windows, doors, transoms, etc., can be left

open, where no regard need be paid to direction of winds and yet furnish the required quota of air to each room per hour with good circulation, he is performing something that can justly be added to the Seven Wonders of the World.

Chicago, Ill. F. J. McAdams.

Live Steam vs. Exhaust Steam for Heating Purposes.

Editor Heating and Ventilating Magazine:

The letter in your March issue, on "Live Steam vs. Exhaust Steam for Heating Purposes," by Wm. Kent, illustrates how far a discussion may ramble. The letter which Mr. Kent criticizes was intended to demonstrate that heat might, under certain conditions, be transmitted faster through a radiating surface from saturated or exhaust steam than from superheated steam. It was not claimed that a radiator fed with superheated steam would be filled with superheated steam all through, which Mr. Kent would seem to infer. After the steam has been cooled to the saturation point and is no longer superheated, it is quite true, as Mr. Kent points out, that the co-efficient of transmission from saturated steam should be used in calculating the transmission.

The real matter at issue was to prove that exhaust steam would transmit more heat through a square foot of radiator surface than would steam superheated by wire-drawing from a comparatively low pressure through a reducing valve, and the object of proving this point was, in turn, to substantiate certain statements which appeared in an advertisement in the January issue of your magazine, in which the statement was made that "Exhaust steam is better than live steam for heating purposes," incidentally because the transmission may be greater, but mainly and most emphatically because the combined cost of power and heat, where exhaust steam is used for heating, is generally less than the cost of producing steam for power and using live steam for heating independently.

As far as commercial heating systems are concerned, any little difference that there may be in the rates of transmission of heat between superheated and saturated steam is, in comparison with the economic considerations, merely chaff, and the kernel, namely, the fact that it is folly to burn coal for heating purposes and at the same time buy current for light and power, when the same coal could fulfill both requirements, seems to have dropped out of sight.

New York. Geo. H. Gibson.

United States Radiator Corporation

United States Radiator Corporation is the corporate title of the new $8,000,000 combination, made up of the United States Radiator Co., the United States Heater Co., the United States Radiator & Boiler Co., the Herendeen Mfg. Co., and the boiler and radiator department of the J. L. Mott Iron Works. The main offices of the company will be at Buffalo, N. Y.

In addition to the capital stock, which is made up in equal amounts of 7% cumulative preferred stock and of common stock, of which $3,200,000 of each has been issued, there are also $1,000,000 in 6% bonds.

The organization was scheduled for the latter part of May, but was postponed until June. It was learned, however, that the officers of the new combination will probably be as follows:

President, R. J. Gross, Dunkirk, N. Y.; vice-president, Charles E. Patterson, Dunkirk, N. Y.; treasurer, H. T. Cole, Detroit, Mich.; secretary, J. J. Blackmore, New York; general sales manager, W. L. Herendeen, Geneva, N. Y.

Mr. Blackmore, who has long been in charge of the boiler and radiator business of the J. L. Mott Iron Works, will probably be located at the company's headquarters in Buffalo, and while the best wishes of a host of friends will accompany him the New York trade will lose one of its oldest and best-known members.

The company is a New York coporation, the charter having been granted at Albany, May 20.

American Society of Heating and Ventilating Engineers

Mid-Summer Meeting in St. Louis

Arrangements have been practically completed for the holding of the mid-summer meeting of The American Society of Heating and Ventilating Engineers at St. Louis, June 30th and July 1st. Headquarters will be at the new American Hotel which has made rates of $1.00, $2.00 and $2.50 per day on the European plan. Every room contains a bath.

The local committee which will have charge of the entertainment features is composed of Prof. J. H. Kinealy, chairman; William H. Bryan, Sam Kauffman, J. T. Bradley and J. R. Wade.

New Ballot Out

One of the largest ballots in the history of the society has been sent out to the membership for vote. It contains the names of 25 candidates for regular membership, four for associate

and two for junior membership. The ballot contains the following names:

REGULAR MEMBERS

J. Bidwell Blake, Chicago, Ill.; Herbert H. Brooks, Elmira, N. Y.; Frederick K. Davis, Washington, D. C.; Wm. F. Devendorf, Rochester, N. Y.; John E. Edwards, Allentown, Pa.; Robt. L. Folsom, Dorchester, Mass.; Edward E. Fox, New York; Harry E. Gerrish, Minneapolis, Minn.; Chas. A. Haslett, Philadelphia, Pa.; Wm. R. Heick, No. Nashville, Tenn.; B. R. Hull, Manhattan, Kansas; Henry H. Lee, Springfield, Mass.; A. B. Marshall, New York; Harry B. Matzen, Hoboken, N. J.; Charles Morrison, Melrose, Mass.; Walter B. Pelton, Dorchester, Mass.; Chas. L. Pillsbury, Minneapolis, Minn.; S. Whitmore Robinson, London, W., England; John D. Small, Chicago, Ill.; Chas. H. Staten, New York; E. Howard Underhill, New York; E. A. Vivarttas, Elizabeth, N. J.; George B. Wallau, Lafayette, Ind.; Frederick A. Wilson, New York.

ASSOCIATE MEMBERS

Harry de Joannis, Chicago, Ill.; John Klingler, Jr., Philadelphia, Pa.; Fred A. Leland, Springfield, Mass.; John J. McHale, New York.

JUNIOR MEMBERS

W. Harwell Allen, Nashville, Tenn.; George E. Grimshaw, New York.

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

WHO HELPS ME HELPS ME

Uniform Standards for Cast-Iron Fittings

Through the initiative of the National Association of Master Steam and Hot Water Fitters, a conference has been arranged with the American Society of Mechanical Engineers with a view to adopting uniform standards for flanged and screwed cast-iron fittings. The mechanical engineers' society will appoint a special committee for the purpose while the master fitters have a standardization committee which no doubt will represent the association.

The successful outcome of previous efforts in a similar direction, undertaken by these two organizations, resulting in the establishment of standard flanges for pipe, fittings and valves will go far towards assuring the success of the present movement.

New York State Association

At the annual meeting of the New York State Association of Master Steam and Hot Water Fitters, held at Albany, May 10, the following officers were elected for the ensuing year: President, Frank H. Falls, Rochester; vice-president, Samuel Wright, Buffalo; secretary-treasurer, William H. Curtis, Brooklyn; recording secretary, Henry B. Gombers, New York; sergeant-at arms, William Scollay, Brooklyn.

Board of Directors.—Charles Geiger, Buffalo; William H. Curtin, Brooklyn; John W. Danforth, Buffalo; Frank H. Falls, Rochester; William A. Flynn, Rochester; Charles A. Geoghegan, New York; Edward F. Joy, Syracuse; Samuel Wright, Buffalo.

New Jersey State Association

At the annual convention of the New Jersey Association of Master Steam and Hot Water Fitters in Newark, May 25, the following officers were elected:

President, Thomas B. Cryer, Newark; vice-president, J. S. Boyce, Asbury Park; secretary-treasurer, Walter A. Lawson, Newark.

Board of Directors.—E. B. Denny, Newark; David H. Moore, Atlantic City; George F. Cappel, Camden; Ferd. Brown, Asbury Park; George Turner, Asbury Park, and William Whitlock, Newark.

American Institute of Chemical Engineers

At the forthcoming second semi-annual meeting of the American Society of Chemical Engineers, which will be held at the Hotel Clifton, Niagara Falls, June 22-24, 1910, the programme will include papers on the following subjects:

"Notes on the Corrosion of Iron and Steel and Its Prevention," by G. W. Thompson.

"The Manufacture and Industrial Applications of Ozone," by Oscar Linder.

"Loss in Coal Due to Storage," by A. Bement.

Federal Furnace League

The third annual meeting of the Federal Furnace League was held at the Hotel Astor, New York, May 10. Among the papers read was an extended argument in favor of the furnace system of heating by the League's official lecturer, Dr. W. F. Colbert, entitled "The Heating and Ventilating of Residences from a Physician's Standpoint." In addition to his address Dr. Colbert presented a proposed formula for warm air furnace installation, based upon what he termed the Federal Furnace unit, derived from the actual heat losses. The formula had been worked out for various sizes of heating equipments and gave in tabular form the sizes of cellar heating pipes and of furnace fire pots. There were also a number of audenda covering various modifications and rules for special conditions. Among other things Dr. Colbert advocated a cold air room where dust and other particles in the incoming air could settle. The plan as outlined

by Dr. Colbert received considerable endorsement and was referred to the executive committee.

The following officers were elected for the ensuing year:

President, Charles S. Prizer, Philadelphia.

Vice-President, J. P. Barstow, New York.

Treasurer, J. F. Kernan, New York.

Secretary, Wilson Ferguson, Philadelphia.

Executive Committee: F. H. Moore, Utica, N. Y.; D. Rait Richardson, New York; J. F. Kernan, New York; J. P. Barstow, New York; E. W. Peck and A. W. Glessner.

Current Heating and Ventilating Literature

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the articles mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

REFRIGERATION

Ice-making from Exhaust Steam. Illustrates and describes methods used at the plant of the Holdrege, Neb., Lighting Co., which makes ice as a by-product of power generation. 3,000 w. Elec Wld—April 7, 1910. 20c.

SUBWAY VENTILATION

The Ventilation of the New York and Paris Subways (Ventilation des Metropolitains de New York et de Paris). Deniau. A review and comparison of the two methods of subway ventilation. Ills. Serial. 1st part. 1,800 w. Rev Ind.—March 19, 1910. 60c.

The National '09 Heater

In the ordinary blast coil, such as the standard 5 ft. x 6 ft. four row section, there are 112 pipes with 56 routes of travel from the steam connection to the drip connection. These routes have been said to form practically dead end pipes, as it would require an air valve of prohibitive dimensions to produce a flux through these 56 1-in. pipes. In all ordinary cold water there is a certain amount of air in solution, and steam almost invariably contains a certain amount of air. As this steam condenses, the air is left in the coil, and some of the pipes become practically dead. In a heavily worked coil the difference in temperature between pipes often becomes so great that some of the pipes are actually cold.

To obviate this difficulty the National Blower Works, Milwaukee, undertook an investigation which resulted in the design of that company's '09 coil, whereby the different sections of the heater are placed in series. All steam which enters the second coil must first pass through the first coil; steam entering the third must pass through the first two, etc. This produces a sufficient flow through the first coil to carry the air on to the second, and through the second to the third, etc. The last coil is subdivided so as to reduce the number of pipes, and increase the flux as the quantity of steam flowing is reduced.

The idea of this coil was to force all the air to one point where it could be taken care of by a single valve. This coil obviated the difficulty named above, and was found to possess other advantages as well.

At the last coil there is a ¾ in. air valve which may be left open to atmosphere when the coil is working anything below its full capacity. The regulation is accomplished by throttling steam at the inlet; that is to say, the working

SIDE VIEW OF A GROUP OF SECTIONS INCASED IN SHEET STEEL JACKET AS ORDINARILY USED IN A DRAW-THROUGH APPARATUS IN CONNECTION WITH A FAN

pressure of this coil is atmosphere pressure, and it is stated to be the only coil on the market which gives a perfect circulation at zero pressure.

Inasmuch as every pipe is purged of air, and consequently forced to perform its full function, the coil actually has a much larger capacity per foot of pipe than the ordinary coil. This amounts to upwards of 25%. In regulating with inlet valve the number of sections in use is easily determined by the pet cocks in the base of each section.

If on opening one of these pet cocks steam appears it means that all coils ahead of this point are filled with steam, as all air is driven on ahead of the steam. Exhaust steam may be used in this coil either exclusively, or together with live steam at practically no back pressure.

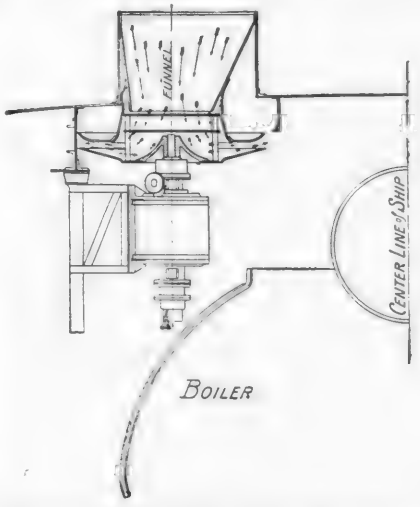
Vertical Turbo-Fans for Forced Draft on Shipboard

The 50 H. P. seven stage vertical turbo-fan illustrated herewith is one of eight designed by the Kerr Turbine Co., of Wellsville, N. Y., for supplying forced draft to the boilers of the U. S. torpedo boat destroyers Sterrett and Perkins.

These turbo-fans operate at a maximum steam pressure of 265 lbs. and non-condensing against 5 lbs. back pressure. The fans, of the Sirocco type, are placed to take air from the outside through funnels on the deck and discharge it into the fireroom through adjustable cone-shaped casings. The fans, each operating at 1,655 R. P. M., deliver 40,000 cu. ft. of free air per minute into each engine room, maintaining within a pressure equivalent to 4 in. of water.

VERTICAL TURBO FAN FOR FORCED DRAFT

The installation arrangement is shown in the line diagram. The turbines are made right and left and are arranged in pairs, one pair delivering into each fireroom. One unit is bolted directly onto vertical stanchion on each side of the boiler. It is evident from the diagram that the space restrictions are quite severe. Small diameter of the turbine is an important requirement and this was made possible without reducing the power below the desired limit only by using seven rotors, each 12 in. in diameter. The use of many stages with light rotors of small diameter in these turbines also overcomes



TYPICAL INSTALLATION OF VERTICAL TURBO-FAN

trouble from gyroscopic action better than using fewer rotors of larger diameter. Experience has shown that in marine work the gyroscopic action of large heavy turbine wheels running in a horizontal plane and with bearings close together subjects the bearings to heavy side pressure as the boat rocks.

The effect of gyroscopic action is made negligible with the smaller wheels and is further minimized in these turbines by the comparatively long distances between the bearings.

New Walker Boiler is a new type of heater for steam and water, which has been brought out by the Walker & Pratt Manufacturing Co., 31-35 Union Street, Boston, Mass. The "New Walker" boiler is now made in four widths of firebox, 17, 22, 32 and 42 in., measured across the top of the fire and designated at 15-20-30 and 40 series. With these four widths of fire as a basis, the company furnishes boilers of any capacity by varying the number of sections. The company's guarantee reads that "every 'New Walker' boiler, if properly piped and connected to a good chimney, will maintain in zero weather, with reasonable fuel and care, if a water boiler, a temperature of 200° at the boiler; or, if a steam boiler, a pressure of 5 lbs. of steam, when connected to the full amount of radiating surface." In new circular matter issued by the company, the "Walker" boilers are rated on attendance every 6 hours, burning 6 2-3 lbs. of coal per sq. ft. of grate per hour in coldest weather and

for attendance every 8 hours, burning 5 lbs. of coal per sq. ft. of grate per hour. Under the 6-hour conditions the capacities of the 40 series range from 3,650 to 8,650 sq. ft. for water and from 2,200 to 5,200 sq. ft. of radiation for steam. Under the 8-hour conditions the capacities range from 2,750 to 6,500 sq. ft. radiation capacity for water and from 1,650 to 3,900 sq. ft. capacity for steam.

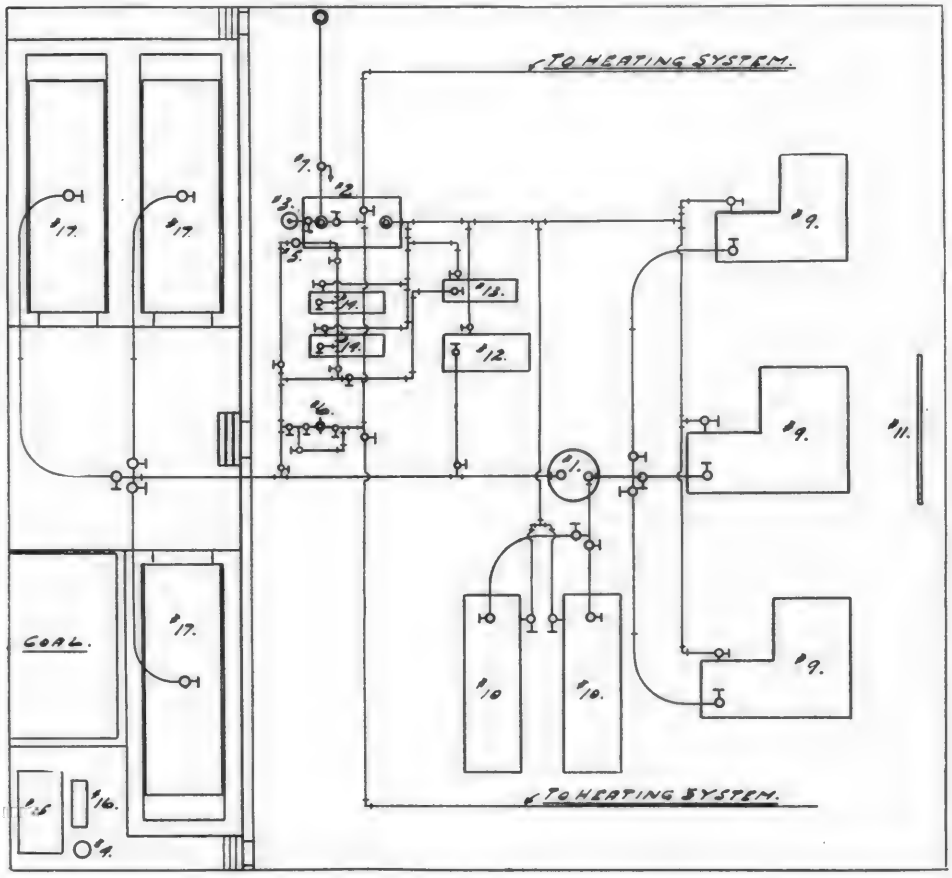
A Typical Boiler and Engine Room Plan

The accompanying diagram shows a boiler and engine room plan of fixtures, auxiliaries and piping so arranged as to require a minimum amount of space for power, light and heat.

The entrained water and moisture in the steam from the boilers being conveyed at a high velocity, is eliminated in the "Utility" receiver separator (shown at 1), which also provides a large volume of steam close to the throttle valves, preventing any wire drawing effect and vibration of steam mains incident to variable load conditions and also assures dry steam, added horsepower and perfect lubrication from the oil for the engines.

The exhaust steam, being capable of delivering about 75% and over of the heat it originally contained when generated in the boiler, should be promptly treated in order to obtain the full benefit this by-product, practically free of cost, possesses; namely, that of heating the building as well as the feed water for the boilers and consequent saving in coal, water, oil and maintenance expense.

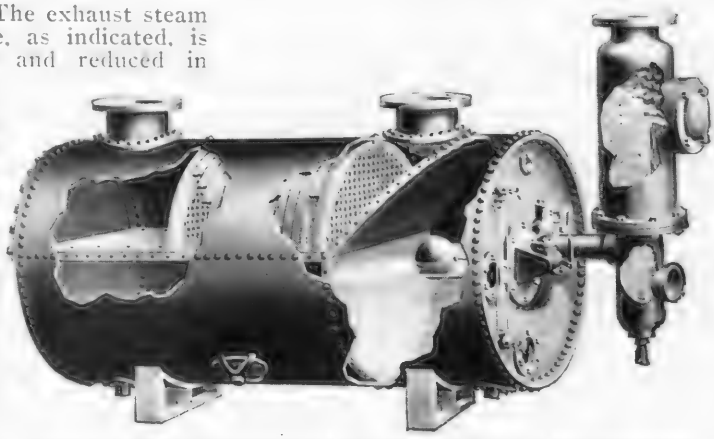
This has been accomplished by the "Utility" exhaust muffler, oil separator, return tank, pump governor and feed water heater in one apparatus shown herewith; saving space, first cost of a multiple of appliances and simplifying



TYPICAL BOILER AND ENGINE ROOM PLAN EQUIPPED WITH UTILITY APPARATUS

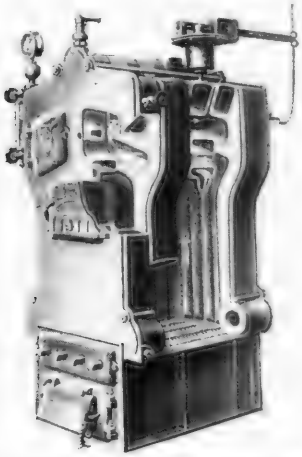
1. Receiver Separator
2. Exhaust Muffler and Oil Separator
3. Feed Water Heater
4. Pump Governor Self Contained
5. Pump Governor Attached to Tank
6. Reducing Valve
7. Back Pressure Valve
8. Exhaust Head at Top of Free Exhaust
9. Engine and Generator
10. Elevator Pump
11. Electric Switchboard
12. Underwriter's Fire Pump
13. Home Service Pump
14. Boiler Feed Pump
15. Boiler Blow Off Tank
16. Pump for Blow Off Tank
17. Boiler

piping arrangement. The exhaust steam passing through same, as indicated, is expanded in volume and reduced in velocity, thereby muffling its sound, and is thoroughly cleansed of oil. This oil can be saved. The separation of oil from the exhaust steam greatly increases its effect in radiation, as the insulating qualities of the oil in contact with the piping have been eliminated. It also prevents the clogging of pilot valves where vacuum systems are used, as well as the expense and annoyance of pipe joint leaks and the covering damage due to oil in the system and resulting odors of decomposed oil through the air valves of the radiation.



UTILITY EXHAUST MUFFLER, OIL SEPARATOR, RETURN TANK PUMP GOVERNOR AND FEED WATER HEATER

The entire amount of exhaust steam condensation resulting thereafter is saved and, with the additional water necessary, is heated to the boiling point by direct contact with the purified exhaust steam. This, together with the high pressure piping condensation accumulated, is automatically pumped direct to the boilers at the high temperature and in its purified state, resulting in higher efficiency in steam generation, due to clean boilers, protection from temperature strains and saving in coal



NEW TYPE OF CRAIG STEAM BOILER

necessary to convert cold water into steam, as well as the additional value in water returned. In view of the fact that while exhaust steam will be at a lower temperature at atmospheric pressure than steam generated at 5 lbs. pressure for heating purposes, it will occupy about one-third more space and require a smaller amount, measured by weight; and is obtained from the power development sources at practically no additional cost. Its treatment as above described is warranted in the economy shown by its application for heating and kindred service compared with the operation of boilers for heating purposes only and incident additional expense incurred in coal used in heating cold water and resulting temperature strains, together with additional boiler cleaning necessitated by the deposit of scale.

In the accompanying illustration of the "Utility" apparatus are shown the evolutions as described. The apparatus can be applied to all systems of exhaust steam heating and power work, with nozzles located to suit piping conditions. This appliance is manufactured by the Standard Steam Specialty Co., New York City.

Craig Steam and Water Boilers, latest models, made by the Williamsport Radiator Co., Williamsport, Pa., are now ready for the market. One of the new models of the Craig steam boiler is shown in the accompanying illustration. Both the water and steam heaters are of the vertical sectional type. They are made with an exceptionally deep fire-pot with large combustion chambers. The flue travel is forward through the lower flues to the front of the boiler, thence upward and back through the upper rows to the smoke outlet at the rear. The boilers are especially adaptable for cellars with low ceilings and are equipped with draft and temperature regulation connections, in addition to grates of labor-saving type. The heater shown has a 15-in. grate and has a capacity of 300 to 675 sq. ft. of radiation. The corresponding size of water boiler has a

capacity of 500 to 1,100 sq. ft. of radiation. The company has recently conducted a series of tests on these new models which have been tabulated in convenient form for the inspection of those interested, the figures showing a high efficiency for both types of heaters. These results may be had from the company's home office or may be obtained from the New York office, 99 Beekman street.

Among the Exhibitors at the National District Heating Association's Convention

Bishop & Babcock Co., Cleveland, O., had a life-sized exhibit of the Reliable automatic hydraulic vacuum pump for creating a vacuum, either in an air line pipe or return pipe of a steam heating system. The exhibit was in charge of Emmons Clark.

Michigan Pipe Co., Bay City, Mich., and its line of steam pipe casings were ably represented by H. B. Smith, Jr.

Alberger Condenser Co., New York, distributed catalogues describing its line of Wainwright expansion joints and Alberger centrifugal pumps.

Vacuum Cleaning Devices were displayed by the American Compressed Air Cleaning Co., and by the McCrum-Howell Co., New York, the latter being in charge of A. B. Marshall and Jos. F. Billmyre, and known as the Richmond vacuum cleaning system, being the new name of the Aero system, built under the Matchette patents.

J. H. Williams Co., Brooklyn, N. Y., makers of chain pipe tools, exhibited a Vulcan bi-jaw wrench in action, a small electric motor furnishing the motive power, while an arm of sheet metal with elbow and wrist joints gave the exhibit a most realistic appearance.

Toledo Pipe Threading Machine Co., Toledo, O., had an exhibit consisting of two pipe threading machines, one threading an 8-in. pipe and the other a 4-in. pipe.

General Electric Co., Schenectady, N. Y., showed its new indicating steam flow meter, giving instantaneous values of the rate of flow in pounds per hour, and its new recording steam flow meter, giving a continuous record of the rate of flow in pounds per hour. Mr. R. E. Woolley, who had charge of this exhibit, was granted the privilege of the floor and gave the members of the association a description of the devices and the principles on which they are constructed.

American District Steam Co., Lockport, N. Y., had a splendid exhibit, consisting of an elaborate and complete model of an underground heating installation. There was also on exhibition a Simplex condensation meter together with models of the company's line of angle joints, expansion devices, atmospheric radiator valves, steam traps and steam regulators, together with types of its insulating materials. The company was represented by Charles R. Bishop, secretary; H. C. Kimbraugh, E. L. Barnes, W. J. Kline and J. O. Walsh.

V. D. Anderson Co., Cleveland, O., had an interesting exhibit, in charge of Jos. H. Meyer, of its Style N and Model D steam traps.

Central Station Steam Co., Detroit, Mich., was represented by J. V. Redfield, president, and J. T. Bordley. Mr. Bordley was in charge in the company's exhibit which consisted of a Detroit condensation meter and Detroit transformer or water heater. The exhibit also included a 6-in. expansion joint, Style A, side anchored, and a 4-in. expansion joint, Style F, or floating type.

American Foundry & Construction Co., Pittsburg, Pa., was represented by W. L. Klingelhofer, general manager; John Klingelhofer, secretary and treasurer; Oliver Haller, chief engineer, and W. H. Pearce, patentee of the company's Crescent casing; Capt. Geo. A. Hurd, and E. B. Tyler. The company had a notable exhibit consisting of a section of Crescent pipe casing laid in concrete and fitted with a double expansion joint, with sole plate and guide, and divided with drip and branches. The company also showed an 8-in. high pressure valve for superheated steam, a double bend pipe with 90° angle and 45° offset, fitted with a Van Stone joint on one end and a rolled Poen joint on the other end.

New Publication

J-M Roofing Salesman is the title of a new house organ published by the H. W. Johns-Manville Co., New York, devoted to J-M roofings and allied J-M building materials. This new publication will be issued the 28th of each month and is a companion publication to "The J-M Packing Expert."

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TRADE AND MISCELLANEOUS NOTES

Coming Events

June 14-15, 1910.—Joint meeting, Central and Eastern Supply Association, Toledo, O. Headquarters at Hotel Secor.

June 20-July 6, 1910.—Industrial Exposition at Detroit, Mich.

June 28-30, 1910.—Twenty-eighth annual convention of the National Association of Master Plumbers at Chicago. Headquarters at the Congress Hotel.

July 26-29, 1910.—Joint meeting of the Institution (British) of Mechanical Engineers and the American Society of Mechanical Engineers at Birmingham and London, England.

June 30-July 1, 1910.—Semi-annual (mid-summer) meeting of The American Society of Heating and Ventilating Engineers at St. Louis. Headquarters at the American Hotel.

Deaths

Charles R. Clow, vice-president of James B. Clow & Son, Chicago, died at his home in Chicago, May 6, of cerebral hemorrhage. He was 45 years old. He was born in Pittsburg and spent his entire business career in Chicago.

J. W. Van Cleave, former president of the National Association of Manufacturers, and at the time of his death president of the Buck Stove and Range Co., St. Louis, Mo., died at his home in St. Louis, May 15th. Mr. Cleave was 61 years old. He came into national prominence through the boycott declared against the Buck Stove and Range Co. by the American Federation of Labor which resulted in the conviction of Samuel P. Gompers and others for contempt of court in continuing the boycott despite the issuance of a permanent injunction restraining the Federation from so doing. In 1908 Mr. Van Cleave organized the National Council for Industrial Defense which now has a membership of 228 concerns.

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Walter E. Heg, general manager of the Automatic Heating Co., Chicago, owner of the Paul patents on vacuum steam heating, died in Chicago, May 15th. He was 35 years old. Mr. Heg had been manager of the company's local offices at Rochester, N. Y., Baltimore, Md., and Philadelphia. Since January 1 he had been located in Chicago as general manager of the company.

New Firms and Business Changes

Illinois Plumbing & Heating Co., Springfield, Ill., has increased its capital stock from $5,000 to $25,000.

Miscellaneous Notes

New York Steam Fitters' strike which, as announced in our last issue, was settled early in May, resulted in a new agreement containing a provision for an arbitration plan to which both parties agreed. According to its provisions the steam fitters are to be represented in any combination of the building trades in the city. The non-union steam fitters, who were employed during the strike, were to be retained, provided they could pass an examining board composed of one steam fitter and one master fitter, with appeal to a referee.

Springfield Foundry Co., Springfield, Mass., will build a new plant, 130 x 155 ft., near Indian Orchard, Mass., to be operated under the management of Richard D. Reed, late of the H. B. Smith Co., Westfield, Mass. A new line of heating boilers will be manufactured at this plant, and will be marketed by the Springfield Foundry Co.

Central Foundry Co., New York, which is in the hands of a receiver, will have its business continued at least until September 1, by authority of the United States District Court. The receiver shows net earnings from February 12th to April 23d of $44,973, the receipts being $493,649 and the expenditures $448,676. The company's offices have recently been removed to 90 West street, New York.

James A. Donnelly, of New York, has been elected vice-president of the Modern Science Club, Brooklyn.

Prizer-Painter Stove and Heater Co., Reading, Pa., which failed several months ago, had its assets sold at auction May 12th. The works and contents, including patterns, materials and machinery, were bought for $30,000 by Francis P. O'Reilly.

Stove Founders' National Defense Association, at its recent annual meeting in New York, elected Stanhope

McDaniel Improved Steam Trap

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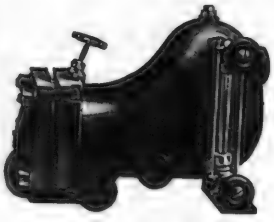

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Boal as president. Mr. Boal, however, found it impossible to serve, and at a special session of the Association, George Mitchell, of Pittston, Pa., was unanimously elected president. Mr. Mitchell is president of the Pittston Stove Co.

Prof. John R. Allen, who has been engaged to establish a new engineering department in Robert College, Constantinople, Turkey, sailed June 4th for Europe. He will return in time for the opening of the Fall term at the University of Michigan.

Building Operations for April, on the whole, compare favorably with those of the corresponding period a year ago. In the eastern and middle western cities there was practically no change, a slight decrease being reported. In the southern cities the increase was 65% and in the Pacific Coast cities the increase was 60%. New York, Philadelphia and Chicago all showed small decreases from last year's figures.

Massachusetts Factory Commission recently appointed by Governor Draper, as announced in our last issue, included in its membership James W. H. Myrick, president of the Autoforce Ventilating Co., Boston. Mr. Myrick has been compelled to decline the appointment, however, on account of business reasons.

United Bunch of Sheep of America, Supreme Fold, with headquarters in Milwaukee, has been incorporated by J. T. Ketchum, David M. Johnson and Louis M. Kornreich. The organization is made up of salesmen in the heating and plumbing trade and has branch folds in Chicago and New York.

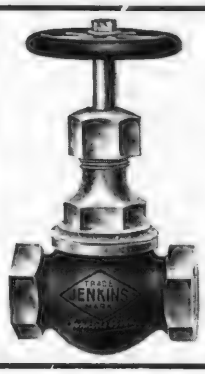
Pennsylvania State Association of Master Plumbers, at its recent annual convention at Lancaster, unanimously adopted the following resolutions:

Whereas it has become the practice of boiler and radiator houses to figure radiation and furnish piping plans for heating plants to incompetent and irresponsible pipe fitters, also to furnish lists of radiator sizes and boiler capacities required of owners, much to the injury and detriment of the practical heating men in the trade, and to the business in general.

Be it therefore resolved, That we the State Association of Master Plumbers in convention assembled do hereby protest and condemn the abovementioned practice, and

Be it further resolved, That a copy of this resolution be sent to each jobbing house in the State.

Massachusetts State Association of Master Plumbers, at its recent annual convention in Boston, May 12, discussed at some length the practice of gas companies installing water heaters, both large and small, undertaking the piping for gas and water at a figure below that



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charged the plumber for the heater alone. The matter was referred to the executive committee.

Manufacturers' Notes

Northwestern Radiator Co., Sauk Centre, Minn., announces that its plant which began the manufacture of radiators April 26 last, is now being operated at full capacity. The officers of this new firm are: President, J. F. Cooper; vice-president, W. B. Dean; secretary, O. H. Schleusener; treasurer, C. A. Emerson.

Real Estate Exhibition, held during the last week in May at Madison Square Garden, New York, which included displays of building materials and fixtures, had a notable display of boilers, furnaces and ranges manufactured by the Richardson & Boynton Co., New York. The exhibit was attractively gotten up with a view of presenting the features of construction so as to be readily understood. Colored ribbons attached to the grate, draft and flues of the Richardson heaters were labeled to show the uses of the various parts. The boilers were shown painted white, with gilt lettering and red interiors.

United States Heater Co., which has become a part of the United States Radiator Corporation, has moved its New York office to the Flatiron Building at Fifth avenue and 23d street. H. H. Hess remains as manager.

American Sheet and Tin Plate Co., suffered the loss of its Canton, O., plant, May 17, through a terrific boiler explosion which wrecked seven boilers. It is stated that all who were employed in the boiler and engine rooms were killed, so that it has been impossible to trace the cause of the explosion.

Peerless Heater Co., Pittsburg, Pa., has placed on the market a new line of sectional heating boilers for steam and water. Among the special features of their construction are the form of crown sheet used and the construction of the water ways, by which a large amount of prime heating surface is secured. The company has recently issued a catalogue describing its product.

Sargent Steam Meter Co., Chicago, has moved its main offices and laboratory to 152-158 Lake street, Chicago.

New Incorporations

Staple Heating & Ventilating Co., Montgomery, Ala., capital stock, $10,000. Incorporators: A. G. Staples, R. Hugger and E. S. Hugger.

George E. Gibson Co., New York, capital $10,000, to conduct a heating and plumbing business. Incorporators: George E. Gibson, Mt. Vernon, N. Y., Miriam Gibson and James J. Thornley.

J. Tonkin Co., Camden, N. J., capital $10,000, to deal in heating and plumbing supplies. Incorporators: Thomas Keogh, Robert Bastian, Jr., and H. B. Martin.

Princeton Heating & Plumbing Co., Princeton, W. Va., capital $25,000. Incorporators: L. A. Cochran, L. H. Sutherland, W. G. Barrer, J. R. Shanklin and J. A. Shanklin.

Consolidated Plumbing Co., Knoxville, Tenn., capital $7,000. Incorporators: J. W. Weatherford, W. A. Slater and B. P. Colwell.

Acme Plumbing & Heating Co., Charlotte, N. Y., to take over business of J. A. Haley and of the Acme Plumbing & Electric Co., of that place.

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E. P. Hirst Co., New Bedford, Mass., to take over the heating and plumbing business of E. P. Hirst. President, E. P. Hirst; treasurer, Winfred W. Bennett; secretary, C. B. Chase.

Saxwood Mfg. Co., Boston, Mass., capital $50,000, to deal in heating and plumbing supplies. President, O. J. Saxe; treasurer, W. H. Woodbury.

Bliss Plumbing & Supply Co., Rochester, N. Y., capital $20,000, to deal in heating and plumbing specialties. Incorporators: Charles H. Bliss, Emma Bliss and Charles T. Klem.

Galva Heating Co., Galva, Ill., capital $30,000, to manufacture boilers, radiators and other heating supplies. Incorporators: E. I. Yokum, C. H. Lyford and H. A. Smith.

Philip Goltner Co., Chicago, capital $25,000, to deal in heating and plumbing specialties. Incorporators: Philip Goltner, George Abham and Harry Lytton.

Selzer Heating Co., Akron, O., capital $20,000. Incorporators: W. J. Selzer, H. D. Kienzle, K. H. Hays, W. F. Bowers and C. E. Raab.

Capone Co., Astoria, N. Y., capital $4,000, to manufacture heating and plumbing specialties. Incorporators: Thomas C. Capone, Rose B. Capone and Alfredo D. Bovi.

Modern Plumbing & Construction Co., North East, Erie County, Pa., to take over heating and plumbing business of H. E. Plubell and of M. D. Grimes. Incorporators: H. E. Plubell, Elmer Eades, G. W. Plubell and L. B. Jones.

Aetna Heating & Ventilating Co., New York, capital $50,000, to manufacture heating and plumbing supplies. Incorporators: E. Glantzberg and A. Nelson, of New York, and C. Klander, of Chelsea, Mass.

Keefe & Murphy, New York, capital $5,000, to conduct a heating and plumbing business.

Ideal Furnace Co., Springfield, Mass., capital $15,000, to conduct a heating and plumbing business. President, Cinton F. Smith; treasurer, Charles F. Mann.

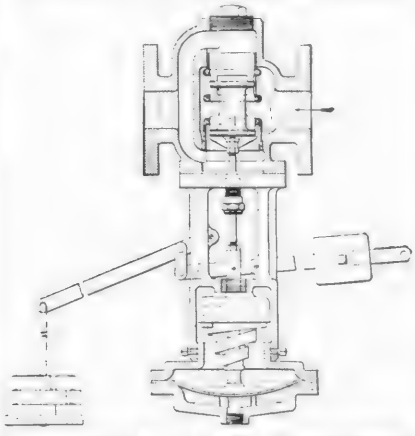
Logansport Heating Co., Logansport, Ind., capital $125,000.

Reynolds-Clement Hardware Co., Parker, S. D., to conduct a heating and plumbing business and to deal in hardware supplies.

American Valve Co., Indianapolis, Ind., capital $10,000, to manufacture heating and plumbing supplies. Directors: Andrew L. Henry, Lenon H. Trotter and George N. Montgomery.

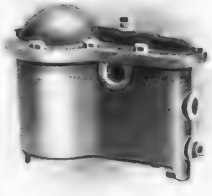
Palace Automatic Ventilating Co., New York, capital $25,000, to manufacture automatic ventilating apparatus. Incorporators: L. S. Wells, J. Fink and M. A. Kesner.

WATERS
Reducing Valves
for steam heating purposes a specialty.
Also valves for vacuum heating systems.



Manufactured by
Waters Governor Co.
34 Oliver St., Boston, Mass.

The Empire Low Pressure Steam Trap
Means Trap Satisfaction



The trap question will be settled if you install an EMPIRE. Adapted to all classes of low pressure work. Perfectly automatic in operation. THE SIMPLEST TRAP MADE. Let us send you one on trial. You will be surprised at its low cost too.

ASK FOR BULLETIN 101

AMERICAN DISTRICT STEAM COMPANY
LOCKPORT, N. Y. CHICAGO, ILL.

Arid Heating Co., Chicago, capital $2,500, to conduct a heating contracting business. Incorporators: Ignatius Beekman, L. J. Delson and Samuel B. Falk.

F. W. Miller Heating Co., capital $10,000. Incorporators: Frank W. Miller, Clarence D. Bauers and Corabelle Robbins.

Victor U. Heather Co., Grand Rapids, Mich., to engage in heating ventilating and sheet metal work. Mr. Heather, the principal of the new company, was formerly connected with the C. S. Weatherly Co., of Grand Rapids.

Contracts Awarded

T. J. Mooney & Co., Nashville, Tenn., heating and plumbing the new Y. M. C. A. building in Nashville.

Mangrum & Otter, San Francisco, Cal., heating, ventilating and kitchen equipment for the new Sisters of Mercy building at Hayes and Stanyan streets, for $85,200. The Wm. F. Wilson Co. has the plumbing contract at $27,000.

William A. Bowers, Milwaukee, Wis., heating and ventilating addition to the Fourteenth District No. 1 school in Milwaukee for $12,000.

American Heating Co., Superior, Wis., heating dormitory of the normal school at Superior for $4,550.

Harrison Engineering Co., New York, has closed a contract with the Hudson & Manhattan Railway Co. for the complete heating and ventilating apparatus for their new car shops in Jersey City. These enormous modern shops, having a space to be heated of nearly 1,000,000 cu. ft., are to be equipped with the Harrison system in which the air is heated by passing through air heaters and distributed by means of fans.

Business Chances

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until June 24, 1910, for the construction complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring of the U. S. Post Office at Aiken, So. Carolina.

Until June 27, 1910, for the construction, including plumbing, of the U. S. Post Office at Minneapolis, Minn.

Until June 29, 1910, for the construction complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring of the U. S. Post Office at Chambersburg, Pa.

Until June 30, 1910, for the construction, complete, including plumbing, gas piping, heating apparatus, electric conduits and wiring of the U. S. Post Office at Greenville, Ill.

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Heating and Ventilating Magazine Co., 1123 Broadway, New York

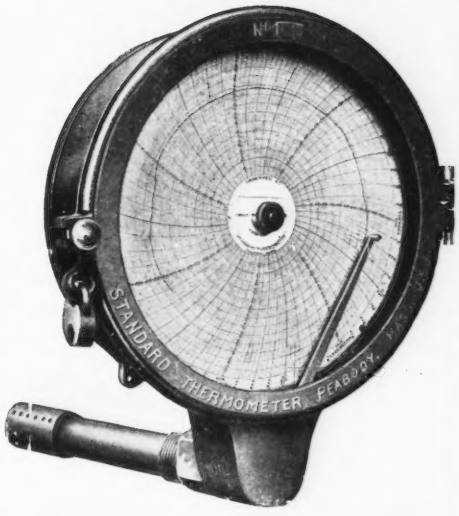
Trade Literature

An Improvement for Exhaust Steam Heating Systems is described in a small booklet published by the Harrison Safety Boiler Works, 3189 North 17th street, Philadelphia, Pa. It consists of the new steam-stack and cut-out valve heater and receiver, recently introduced by that concern. It is claimed that the use of this heater will reduce the expense of equipping any system of exhaust steam heating by saving the cost of an independent separator in a by-pass around the heater to the heating system, and the cost of the trap, valves, fittings, etc., required for its installation. Several different types of the new heater are illustrated, some adopted for the very limited headroom of basement boiler rooms.

New York Blower Co., Chicago, Ill., manufacturers of fans, engines, heaters, ventilators and galvanized piping and engineers for heating, ventilating, drying and mechanical draft, has issued a new catalogue of its products. It is one of the handsomest trade publications of the year and will be valued as well for its artistic appearance as for the fund of information it contains. The fans and heaters made by the New York Blower Company are shown in detail in many half-tone views and are accompanied by tables giving capacity, space required for setting, shipping weights, comparative prices and other information desired by the architect, engineer or customer. Among the new types shown is the Serivane, of the Multiblade style. The catalogue also contains typical layouts of heating and ventilating systems together with several pages of information regarding air movements, influence of temperature and other useful data. Size 6 x 9 in. (standard). Pp. 80.

Zeck's Combination Heating System, sold by Alex. Zeck & Son, Grafton, West Va., is described in a recently-issued booklet. This system, it is claimed, is the only hot water system that can be used in high buildings. It is described as better than a hot water system because it does not depend upon the circulation of a large quantity of water. The water is placed in the radiators where it is used to store the heat. By the evaporation of a few gallons of water it has been found possible to place the heat where it is wanted and in such quantities required by the outside temperature. The advantage gained is the difference between circulating 300 gals. of water, the amount usually contained in a 10-room building, from the cellar to the attic repeatedly until raised to a temperature of from 160° to 180° F., against raising 30 gals. to a temperature of 212° F., the

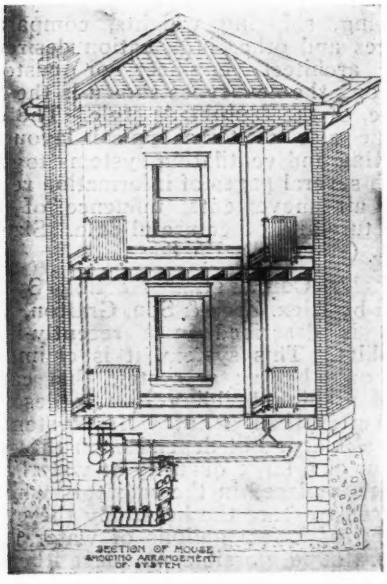
Why Install an Expensive Heating and Ventilating System



if it is not kept up to its initial standard of efficiency? The **Standard Recording Thermometers** will tell exactly if the system is producing results. Every degree of temperature—during every hour of every day of every week—is accurately recorded and comparisons can be made so as to enable an even temperature to be maintained. ¶ Standard Recording Thermometers are necessary adjuncts to the successful operation of every heating and ventilating installation.

SEND FOR CATALOGUE H

Standard Thermometer Company Clinton and Shirley Streets Boston, Mass.

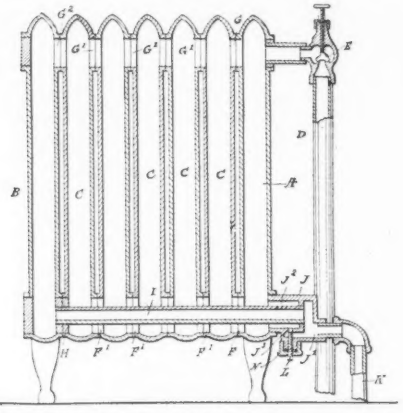


SECTION OF HOUSE EQUIPPED WITH ZECK'S COMBINATION HOT WATER HEATING SYSTEM

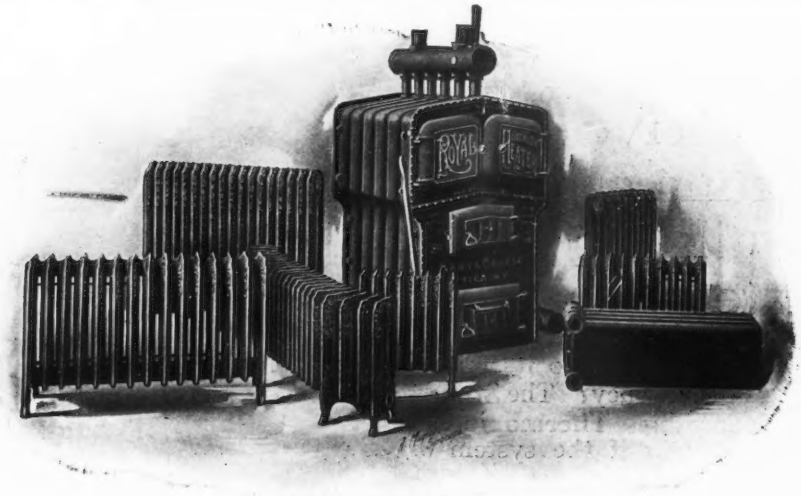
evaporation of less than one pint of this water being said to be more than is required to fill all the piping in the system. Other advantages mentioned with this system are the use of smaller piping and the doing away with generators or appliances to increase the pressure. The patents on the apparatus are dated March 3, 1908, and September 30, 1908, and the features in the construction of the system are specially designed radiators, graduated hand valves and special fitting and check valve.

New Book.

Proceedings of the first annual convention of the National District Heating Association, held in Columbus, O., Novem-



CROSS SECTION OF RADIATOR USED WITH ZECK'S COMBINATION SYSTEM



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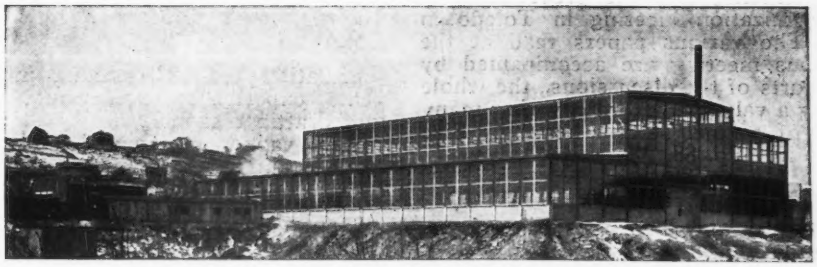

The New Foundry of the Waterbury Castings Company, Waterbury, Conn., Showing the Large Amount of Glass Wall Surface.

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In this equipment the ducts are so arranged that the heat is concentrated where the men are working instead of collecting in the skylight, and the smoke and fumes are forced out through the ventilators.

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ber 10-11, 1909, have been issued in book form including also the proceedings of the organization meeting in Toledo in 1909. The various papers read at the Columbus meeting are accompanied by full reports of the discussions,, the whole forming a valuable record covering many phases of central station heating. Size 6¼ x 9 in. Pp. 88.

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Position Wanted as consulting, heating and ventilating engineer by a middle-aged man with 25 years practical experience in all classes of steam work, exhaust, vacuum, high and low pressure, and hot water heating systems and power plants. A good draftsman and a practical superintendent of work. Best of references. Address A. S. of H. & V. Engineers, 81 Pine St., New Haven, Conn.

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